

Accurate Grinding
Competent Angles
PAGE 67

Mass Production
Simplifying Assembly
Modern
PAGE 75

Machine Tool Builders
Talk Industry Needs
at
Production Round-Table
PAGE 99

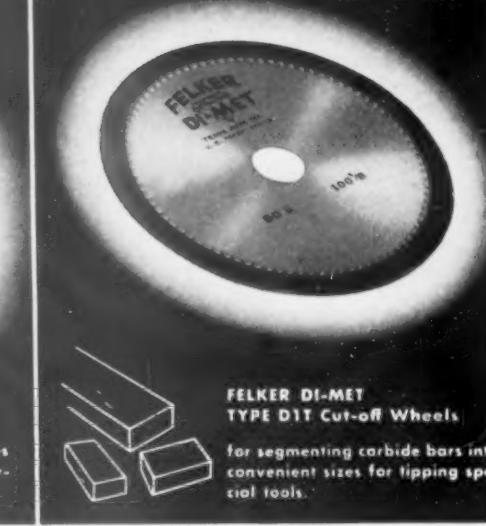
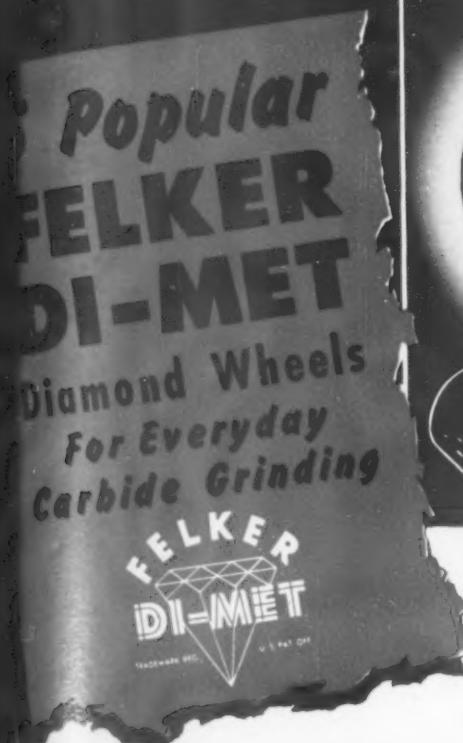
ASTE Meets
at Syracuse
PAGE 102

MACHINES AND METHODS FOR PRODUCTION

NOVEMBER, 1944

TOOL ENGINEER

Official Publication of
American Society of Tool Engineers



Felker DI-MET diamond wheels are fast and free cutting, with long, economical life. Made in both metal and resinoid bonds in all popular types and sizes. Write for our free catalog giving specifications, prices, discounts and operating information. No obligation.

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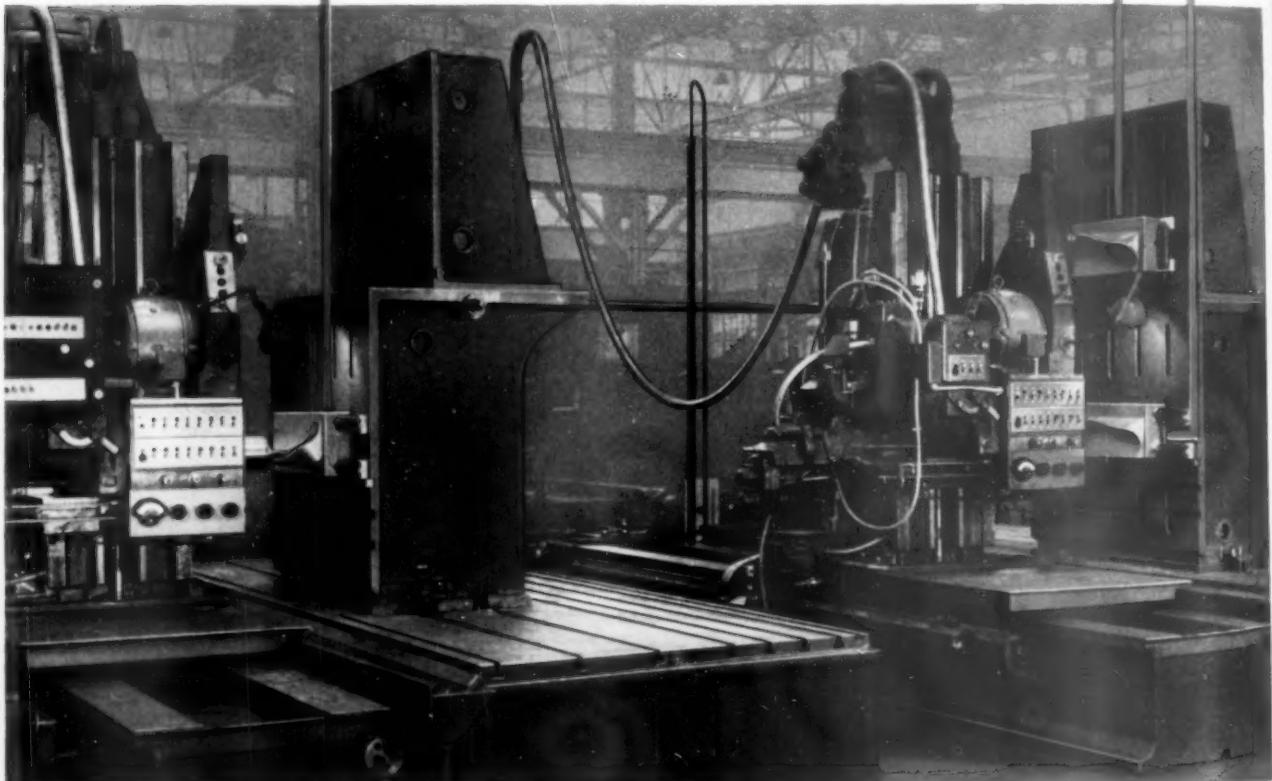
LEFT AND RIGHT— from a single master

Here's a war-inspired Keller improvement of far-reaching significance for further war production and, soon we hope, for faster peacetime tooling.

With synchronous control reversal as illustrated, two Kellers can now produce left- and right-hand dies of perfect symmetry in a single operation. As the right-hand "sending" machine cuts a right-hand die guided by the master (see upper right corner of photograph), it sends an identical but reversed pattern to the left-hand "receiving" Keller machine.

Result — two dies from a single master together with symmetry impossible to achieve with separate handmade left- and right-hand masters as formerly required. **Interpretation** — faster tooling for all automotive and other parts, such as fenders, doors and side panels, that require symmetrical right- and left-hand parts — plus worth-while cost reduction.

Complete information regarding synchronous control reversal for right to left reproduction for P&W Keller machines is available upon request.



PRATT & WHITNEY

Division Niles-Bement-Pond Company

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TeBo Gages



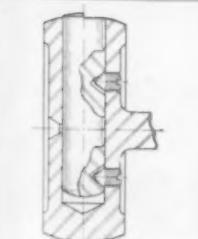
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American Industry**



ONE OPERATION
Checks Minimum and
Maximum Tolerances



**REVEALS BORE
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ANY POINT**



**ADJUSTABLE
FOR CHANGE OF
TOLERANCES**

**Check Bores in ONE Operation More Accurately,
60% Faster Than Conventional Type Plug Gages**

TeBo GAGES, long the favorite bore checking instruments of Swedish and other European precision workers, are now produced by Standard Gage Company. Considered by users the most desirable fixed limit type gage, TeBo can make a tremendous contribution to precision in American mass production. It performs, in one operation, the several functions required of plug gages, with an ease and accuracy that is a revelation to expert craftsmen.

With TeBo Gages, both minimum and maximum limits may be checked in one operation. They reveal the internal conditions of the bore at any point, indicating such factors as out-of-round, taper, belling, as well as dimensional deviations. They can be used with equal accuracy in soft as

well as hard metals. May be used in thin walled bores without risk of distortion.

The chromium plated TeBo Gage head is a sector of a true sphere, the ideal shape for internal gaging. It passes through a bore freely, without jamming or forcing. A spherical projection controls maximum tolerance measurements. Standard Gage has added adjustability to this projector by means of two ingenious set screws.

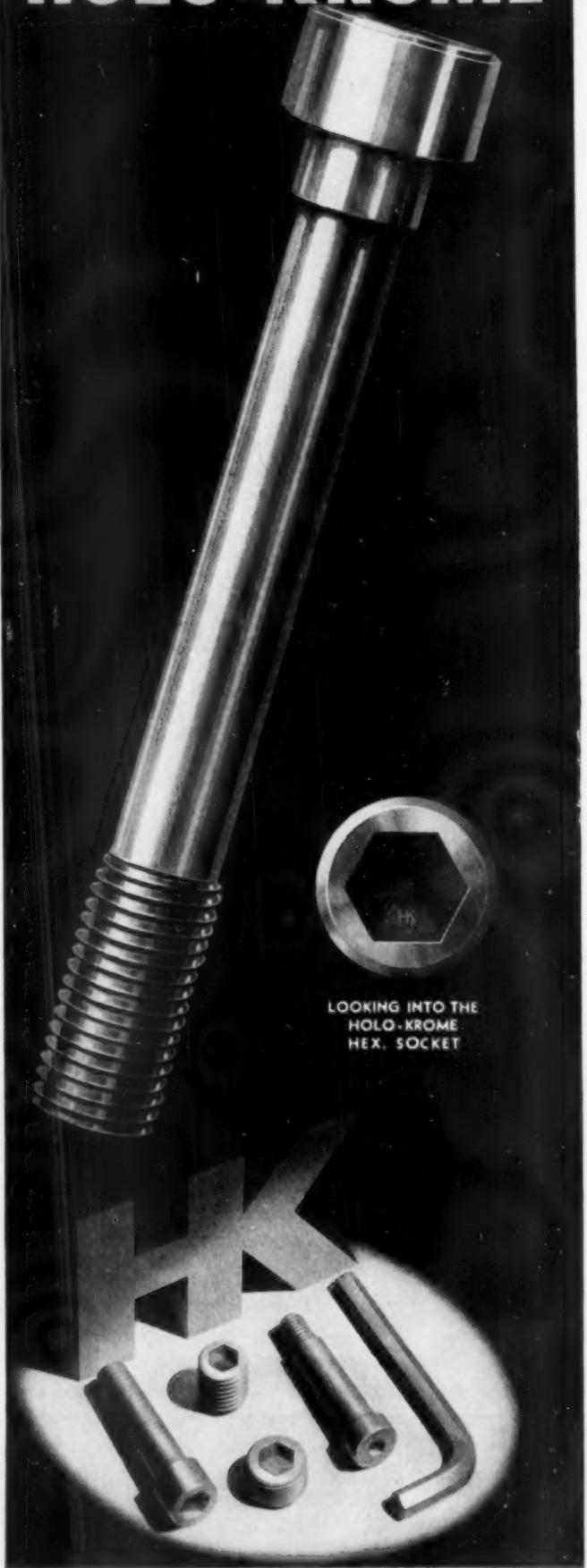
TeBo Gages are light in weight and precisely balanced. They minimize fatigue and may be used over long periods without strain. Their operation is so simple and direct and their findings so easily understood that major gaging operations may be entrusted to workers of slight technical skill. Users report savings up to 60% in gaging time through use of TeBo Gages.



WRITE FOR NEW TeBo GAGE BOOKLET
TeBo Gages Patented in U. S. and Foreign Countries. Other Patents Pending.

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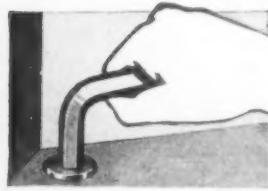
HOLO-KROME



LOOKING INTO THE
HOLO-KROME
HEX. SOCKET

LEADERS LOOK AHEAD

Industries, today actively engaged in producing war-time essentials, are also thoughtfully planning for the future . . . Just ahead are vast unexplored markets, in addition to the more familiar ones. To satisfy these, new machinery and machine tools, unique parts and gadgets are being created and blue-printed. Every component part is being studied to be certain it will give the performance and do the job for which it is intended . . . Yes, Leaders are Looking Ahead — preparing for "the day"!



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FEATURE - QUICK &
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SOCKET SCREWS The BETTER Fastening Method

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THE TOOL ENGINEER

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TECHNICAL FEATURES

Grinding Compound Angles on Forming Tools	67
Special Cutting Head Speeds Boring Mill Output	70
Electronic Drive Gives Old Machines New Life	72
Flame Hardening Blanking dies	73

STREAMLINED PRODUCTION:

Precise Tooling for a Precision Product	75
Superfinish—To Date	86
Tooling Dock Aids Jig Boring	88
Metric for Postwar	92
Production Data Sheet	97
The Crib	98

MEN, MATERIALS AND MACHINES

PRODUCTION Round-Table:

Machine Tool Builders Foresee Postwar Opportunity	99
Tool Engineers Prepare for Peace	102
Surplus Policy Charted at Machine Tool Builders Meeting	109

DEPARTMENTS

AND SPECIAL FEATURES

Production Perspectives	65
Machine Tool News	106
Capital Communiqué	111
Industrial News Digest	115
Greenie—cartoon feature	115
New Equipment	162
New Literature	186
Handy Andy Says	194
A. S. T. E. Doings	200
Passing Parade	212

Classified Advertising	224
Advertisers' Index	226

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Publisher's Letter

AS always, it was a pleasure to meet many friends of long standing at the American Society of Tool Engineers Semi-Annual gathering in Syracuse.

The Society's presentation of a Life Membership to me at the Banquet Meeting marked a bond between men I am proud to know and associate with—and, myself. I sincerely appreciate this honor which was tendered me on behalf of the entire A. S. T. E. membership by President Douglas Burnside.

During the life of that membership, it will be my continuing purpose to promote the objectives of the American Society of Tool Engineers. Attainment of those objectives—and proof of their inherent value—is evident in the production record which is helping to make America victorious. I consider them standards of how to do things

better, an ever insistent demand for improvement.

Beginning next February, under our new title PRODUCTION ENGINEERING & MANAGEMENT, we will continue to support every worthy undertaking of the A. S. T. E. Our editors will continue to and look forward to recognizing prominently in the columns of our publication every contribution to the industry which we all serve.

Home from Syracuse for a day, Wallace Scotten and I then traveled to Hot Springs, Virginia, for the Annual Meeting of the Machine Tool Builders Association. Naturally, all of us are waiting eagerly for announcements of postwar machine tools. I know that many production men will be amazed at the progress planned. Yet, a main subject of the meeting, it seemed to me, transcends all thought of machine tool improvements.

It is almost beyond belief that at this late date these industrial leaders are still forced to demand a fair consideration of their future as it is affected by the present approach to

renegotiation and taxation. I say their future, but it's much more than that.

These men are not asking for profit. They are asking to retain capital, to develop machines which will affect the future of all of us.

More efficient machines mean an improved production economy. In turn, that improvement means lower costs, more money for wages, more purchasing power. There has been much talk of spirals by our government economists. Let's not have a downward spiral because the money which can be used to increase buying capacity—and taxing capacity too—is taken from this wealth-creating source. The money taken now will prove as useful as the gold in that artificial mine down in Kentucky.

Cordially yours,

Roy T. Bramson

Publisher

*Published the first Thursday of each month, by The Bramson Publishing Company. Advertising, Editorial, and General offices at 2842 West Grand Boulevard, Detroit 2, Michigan. Telephone: MADison 4077.

*Acceptance under the Act of June 5, 1934, at St. Joseph, Michigan, authorized December 18, 1940. Printed in the U. S. of A. Copyright, 1944, by The Bramson Publishing Company. Member: Controlled Circulation Audit, Inc.



Suppose Bill came home tomorrow . . .

SURE it would be mighty nice to have Bill back on the job . . . giving you the same type of service which you received before he left. Yes, your *Industrial Supply Distributor would welcome Bill back, too . . . Bill and all of his brother salesmen who are doing a bigger job right now.

We know that Bill won't be home tomorrow

. . . nor even the day after. But we feel confident that the day is coming . . . soon!

In the meantime, remember that your *Industrial Supply Distributor is your time-saving, money-saving, worry-saving central source of supply. You can help him serve you better during this emergency by ordering as far in advance as possible. Don't forget to . . .

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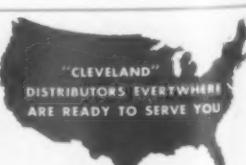


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Two Operations in
a Single Setup
without
Changing Tools



PRODUCTION DATA

Operations—Profile Mill .369" Radius and Mill Channel.
Machine—GORTON 9-J Super-Speed Duplicator.
Part—Rear of Crankshaft—Steel.
Cutter—Special .738" dia. Ball Cutter—4 Flute.
Holding Method—Special Fixture.
Feed—Manual.
Spindle Speed—500 r.p.m.
Stock Removed— $\frac{1}{8}$ ".
Floor-to-Floor Time—15 minutes per piece.

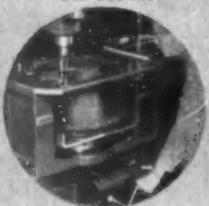
GORTON ENGINEERING SERVICE—
 You are invited to consult Gorton engineers, without obligation, on your next production profile milling jobs. Gorton "Tracer Control" may give you the simplest, practical answer to lower cost production. Please submit part, print or specifications to your nearest Gorton Dealer or to the Gorton Factory at Racine, Wisconsin.

A prominent airplane engine manufacturer cut production costs, saved tying up expensive machinery and conserved skilled workmen by profile milling this radius of an engine crank-shaft section on the Gorton Duplicator. Semi-skilled help operated this machine, obtaining smooth finish on the profiling of the irregular channel contour (1) on the part shown at right, and the milling of the channel (2) below this contour.

The Duplicator was set up with a special master in order to eliminate changing tools or resetting the work. A special fixture was used to hold the work at an angle to allow cutter access in milling the channel.

The Gorton Duplicator is the ideal machine for handling jobs like this where uniformity in quality and high precision repetition of all dimensions is required.

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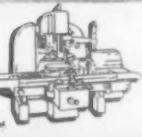
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To Help Produce Weapons of Peace...

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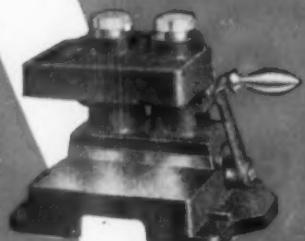
STANDARD RAPID CLAMPING DRILL JIGS

Spring or Rack and Pinion Types — Square
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A large factor in winning the coming peace will be America's METHODS of production. Our factories will help rebuild both our own inventories and the countries impoverished by war.

Those plants which have been using Siewek Standard Rapid Clamping Drill Jigs for war goods will be in excellent position to convert to the "weapons of peace"—because these jigs were designed for easy adaptability on a wide variety of jobs. With their simple adapters—which are easily made right in your own shop—one Siewek Jig will take the place of dozens of special jigs.

The saving in time, labor, material and money, which Siewek Jigs make possible, will count heavily in meeting your post-war competition. Investigate these advantages today—contact your nearby Siewek representative or write us, asking for Catalog No. 50J.

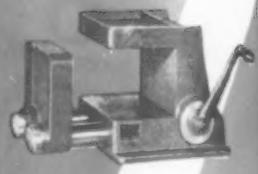
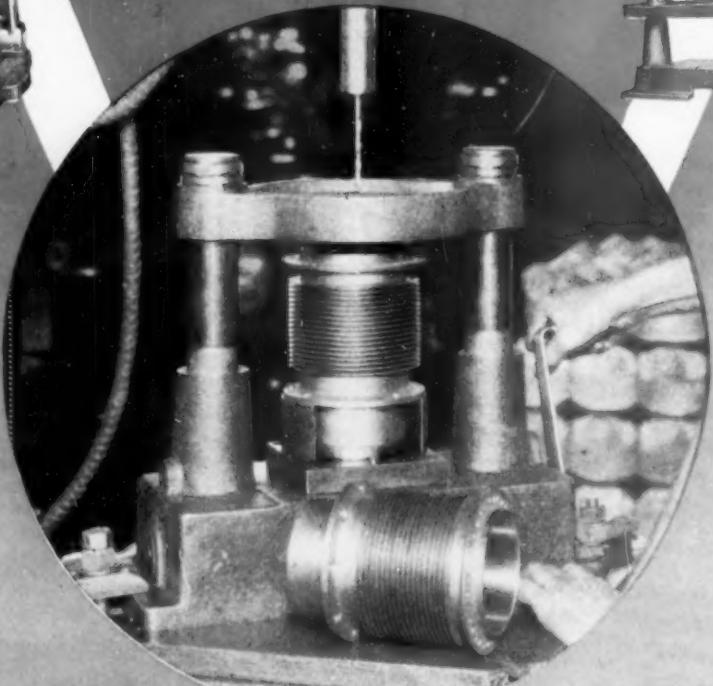


Type B
Spring Jig



Type D
Spring Jig

Type C
Spring Jig



Type H
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Rack and
Pinion Jig
for 2-way
Drilling



Type E
Spring Jig



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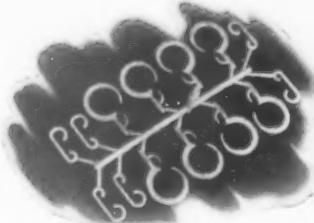
OF DOMESTIC INDUSTRIES, INC.

DETROIT (FERNDALE STATION) MICHIGAN • Representatives in Principal Cities

Could you Mill this 14 Cavity Mold complete in 52 Hours?



Close-up view of cavities in the solid mold block.



Plastic shower-curtain hooks in multiple, as they come from the mold.

Photos—Courtesy The Kampa Manufacturing Co.

1000-P

This 14-cavity plastic mold is a "sticker" if you try to produce it by ordinary methods — but read this report of its production with the Milwaukee Rotary Head Milling Machine!

The Milwaukee Rotary Head method made it possible to set up both halves of this shower curtain hook mold on the machine table. One cavity of each shape was then laid out by means of a scribe held in the machine

spindle. Each milling operation was first performed on the location of the layout and then repeated for each additional cavity. Uniform and unvarying precision is repeated by this multiple origination of cavities with the Rotary Head Method. Total milling time complete — 52 hours.

Write for Bulletin 1002-C for full information on this unusual machine tool and the Rotary Head method of milling.

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This new book gives you a clear understanding of the new markings on Wheels by Carborundum and the grades they indicate. It's also full of information on the proper selection, identification, specification, use and care of grinding wheels.

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THAT'S right—from now on it's going to be a lot easier to get the right grinding wheel for the job! Carborundum, along with all other makers of grinding wheels, has adopted a new system of wheel markings. * The new system is one of marking only. So wheels with similar markings by different makers may not grind alike.

* Effective soon, these new markings will appear on all Grinding Wheels sold by Carborundum. Because so many of these wheels are in use in industry, it may take a little while before the transition is complete. For as long as is necessary to help our customers, Grinding Wheels by Carborundum will carry both the old and new markings.

**YOU NEED THIS BOOK TO
SELECT THE RIGHT GRIND-
ING WHEEL FOR THE JOB!**

**IT'S ALL
IN THIS NEW
BOOK BY
CARBORUNDUM!**



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FOR THE MODERN GRINDING JOB

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N.Y., U.S.A.

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8. Diamond Wheels
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11. Thread Grinding Wheels
12. Cutting-Off Wheels
13. "MX" Wheels
14. Tool Room Sticks
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16. New Gradings
17. Wheel Speeds



The Carborundum Company, Niagara Falls,
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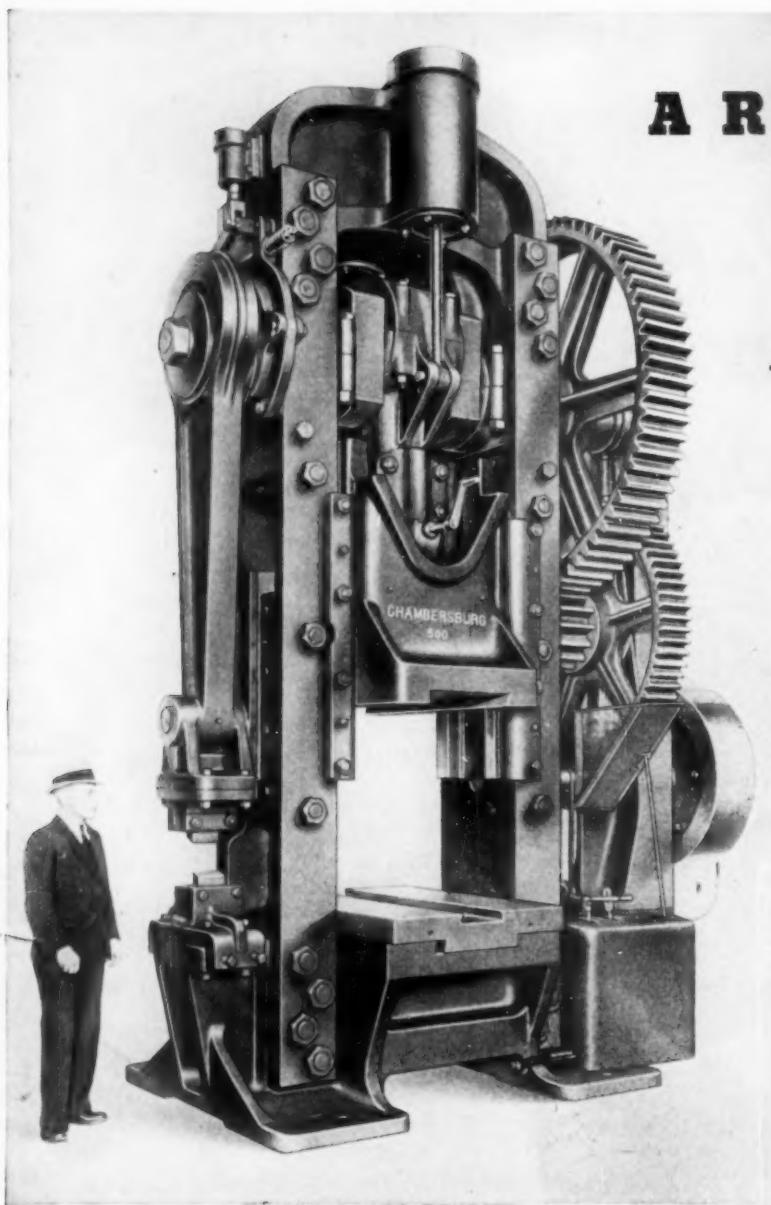
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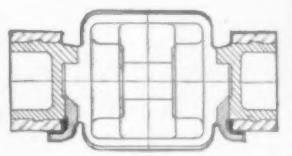


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*Detail of
Interlocking
Side Frame Construction*



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(PATENTED)

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Write for Bulletin 208-A

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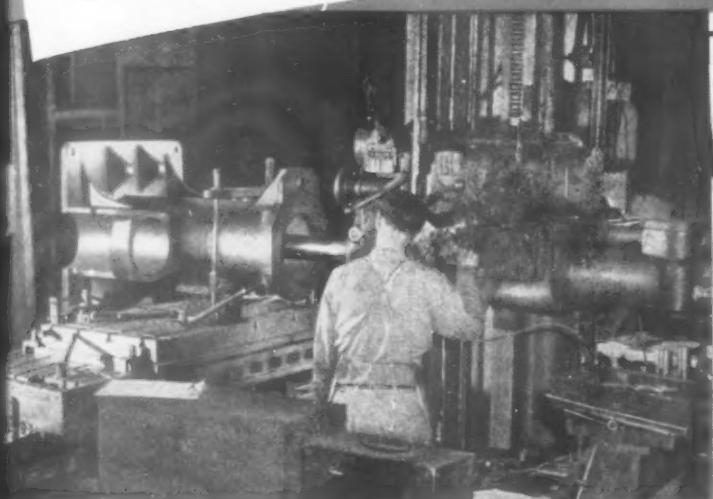


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HAMMERS · CECOSTAMPS · PRESSES

G & L PRODUCTION FACTS on a typical job

- 1 Eight Hours Production Time Saved
- 2 Accuracy Improved
- 3 Two Set-Ups Eliminated
- 4 Layout Eliminated
- 5 Two Machines Replaced



Housing clamped in position showing boring tool used to bore cylinder.

1 Present floor-to-floor machining time on this cast semi-steel housing is $9\frac{1}{2}$ hours. Formerly the same job on a vertical lathe and drilling machine required $17\frac{1}{2}$ hours. The G. & L. Horizontal Boring Machine saves eight hours on each casting machined.

2 Two set-ups were required to face and bore this casting on a vertical lathe. The housing is now mounted on a plate or base which in turn is clamped to the horizontal boring machine table. Instead of unclamping the work, the part and base is turned 180° for facing and boring operations.

3 Because all boring, milling, drilling and tapping operations are completed before the work is unclamped, overall accuracy is greatly improved. Bored and drilled holes and milled surfaces are always in correct alignment with each other.

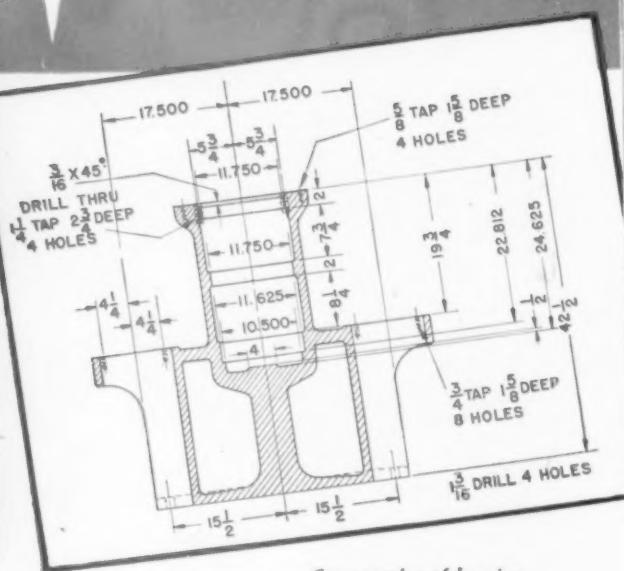
4 Layout is not required before the casting comes to the machine. All holes are drilled using the machine scales and verniers for correct hole location. Drilling and tapping operations are simplified.

5 The G. & L. Horizontal Boring Machine replaced a vertical lathe and a drill press. Production was increased and machining costs were reduced for unnecessary work handling was eliminated.

Drilling and tapping operations are performed on the horizontal mill without disturbing original work setting.



Eight hours saved in machining this semi-steel housing.



Cross section of housing showing dimensions and machining operations necessary.

Now is the time to analyze your own production methods. You may be able to make similar savings with the G. & L. Horizontal Boring Machine. Our staff of experienced engineers will be glad to help you with your machining problems. There is no obligation for this service, merely submit the problem.

Additional Data

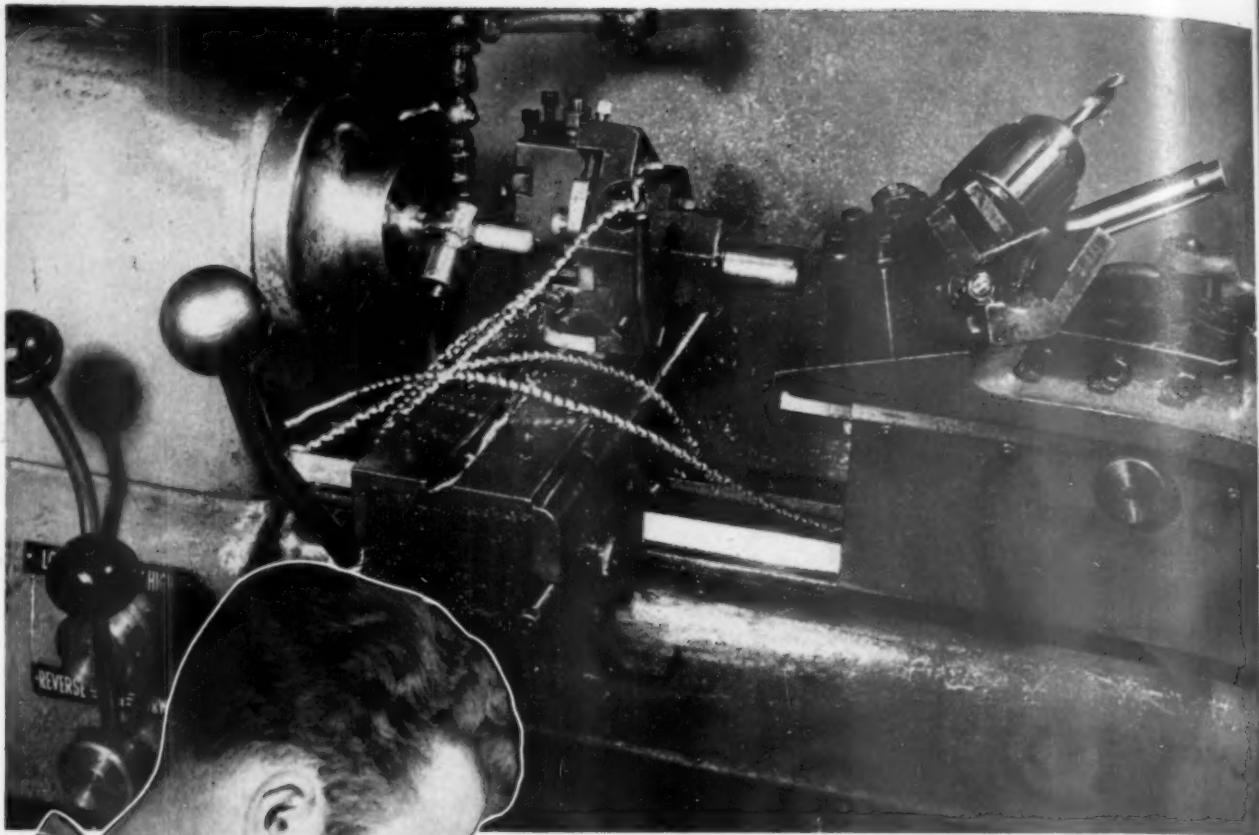
...covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. TE 114.



GIDDINGS & LEWIS MACHINE TOOL CO.

132 DOTY STREET, FOND DU LAC, WISCONSIN



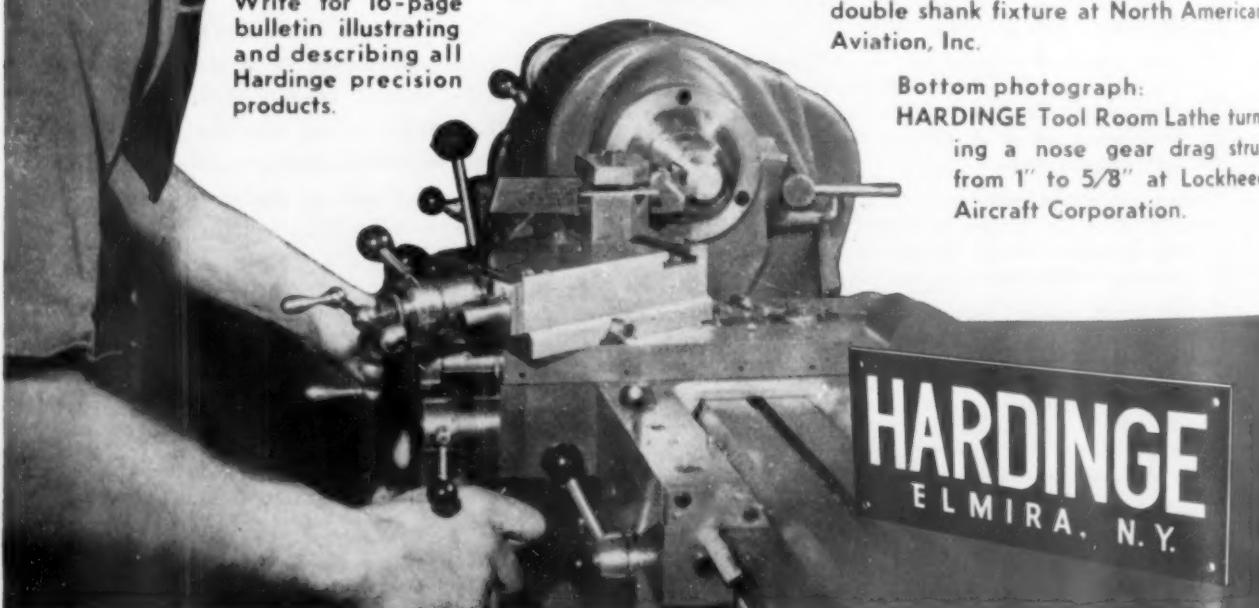


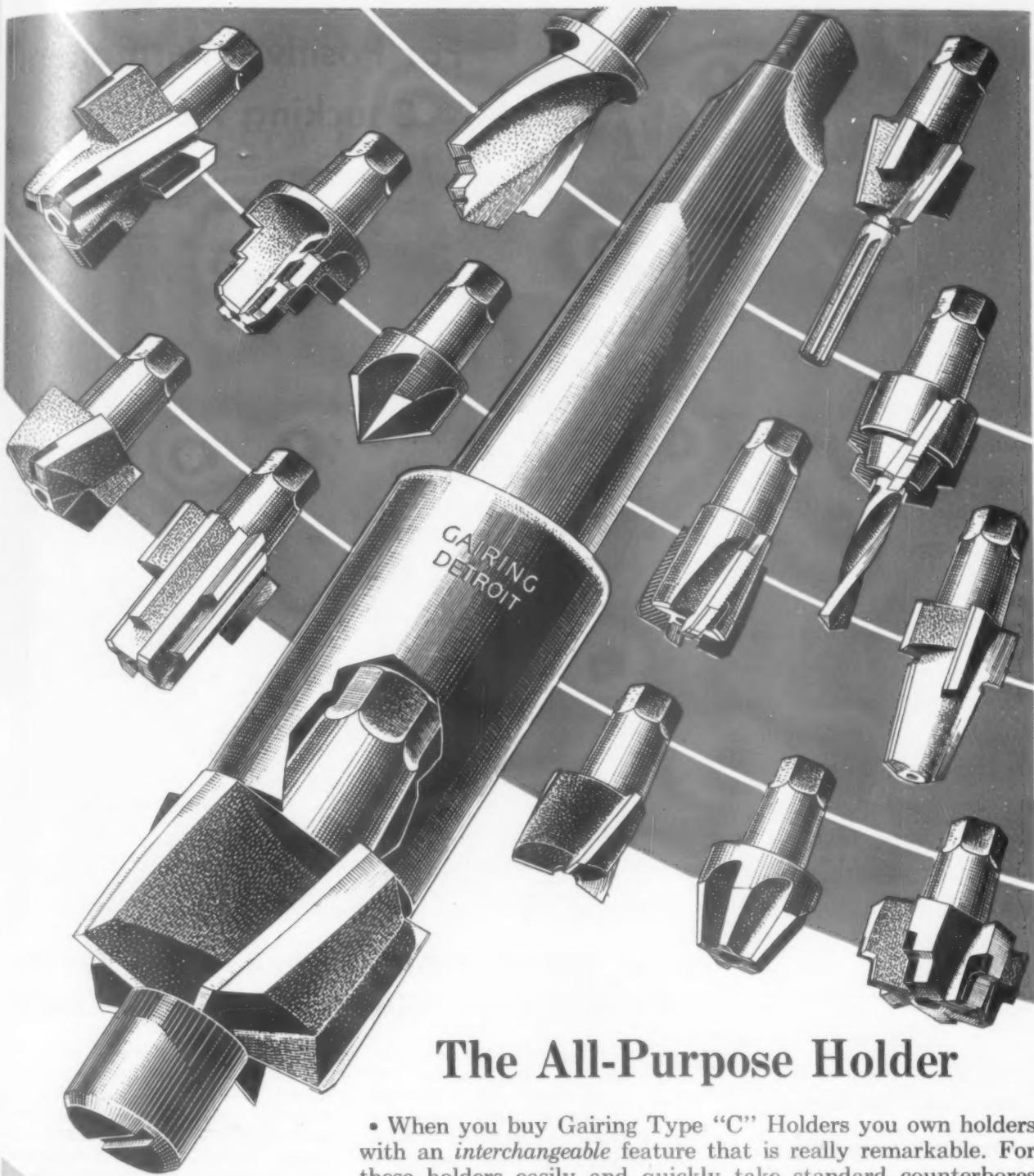
HARDINGE means precision performance to the Aviation Industry

Top photograph: HARDINGE Second Operation Machine set up to drill, turn and undercut a 24 S.T. aluminum alloy casting held in a double shank fixture at North American Aviation, Inc.

Write for 16-page bulletin illustrating and describing all Hardinge precision products.

Bottom photograph:
HARDINGE Tool Room Lathe turning a nose gear drag strut from 1" to 5/8" at Lockheed Aircraft Corporation.





The All-Purpose Holder

Our Engineering Department
will gladly assist you with any
tooling problem you may have.
No obligation.

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Detroit 32, Michigan.

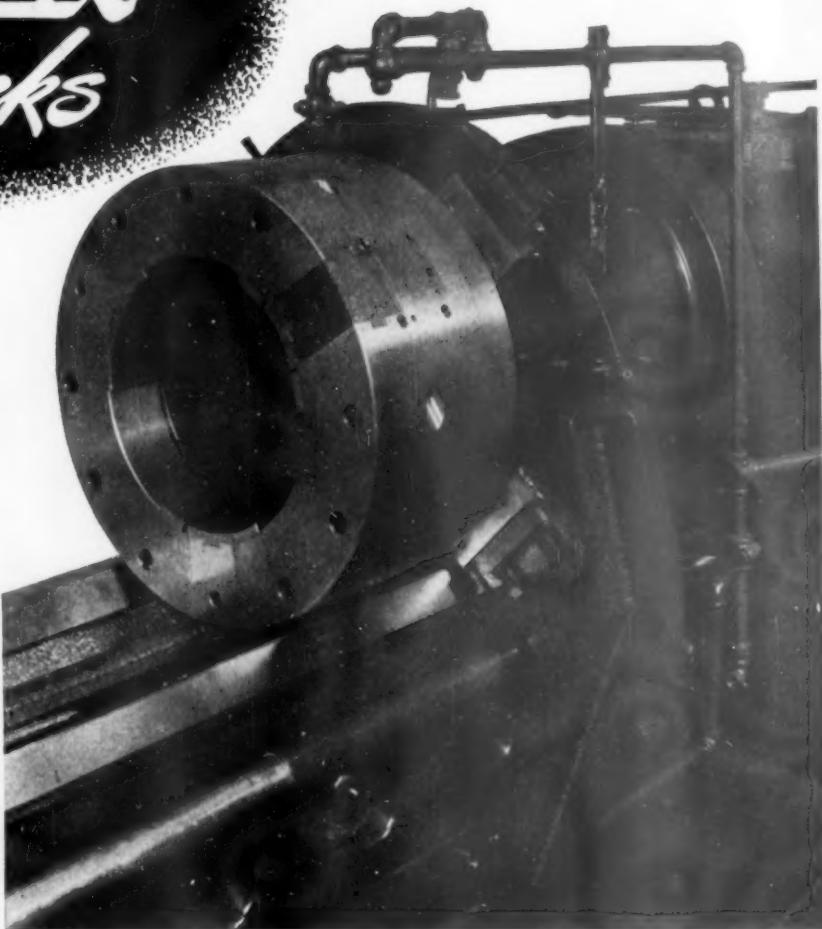
GAIRING

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- When you buy Gairing Type "C" Holders you own holders with an *interchangeable* feature that is really remarkable. For these holders easily and quickly take standard counterbores and countersinks as well as *all types* of end cutting tools regardless of shape, contour or angles. They are adaptable for single or special purpose, or for a series of progressive operations.
- The taper and hexagon socket in this holder centralizes the cutter and serves as a driver co-acting with the taper and hexagon shank of the cutter. Thus, rigidity and perfect alignment are assured.
- The *adaptability* of these holders is amazing—their intelligent use is production economy, particularly in these days of reconversion. Write today for sizes and prices.

"LOGAN" Chucks

For Positive, Permanent
Chucking Accuracy



Wherever maximum rigidity and positive, lasting chucking accuracy are required, there is a "Logan" chuck that will do the job faster—and better.

Shown here is a heavy duty Warner & Swasey turret lathe equipped with a "Logan" 27 inch, 3 jaw American standard chuck. Note the gripping pads on the inside of the jaws, and the specially hardened wear strips. Also the mounting arrangement on the special long adapter, supported by a steady rest.

Other
"LOGAN" PRODUCTS used on this Lathe:

- "LOGAN" POWER UNIT
- "LOGAN" ROTATING TYPE HYDRAULIC CYLINDER
- "LOGAN" HYDRAULIC CONTROL VALVE
- "LOGAN" PRESSURE REGULATING VALVE

HOW "LOGAN" ENGINEERS BUILD EXTRA SERVICE AND ACCURACY INTO EVERY "LOGAN" CHUCK

"LOGAN" Chuck bodies are one-piece electric steel castings, cored for light weight and correct balance, and radially reinforced for extra rigidity. Special heat treated steels are used in all working parts subject to operating stresses. Jaw levers are chrome nickel steel, drop forged and heat treated. All lever pins are nickel steel alloy, hardened and ground. Alemite lubrication of all working parts insures lasting accuracy and efficient operation through year after year of heavy-duty service.

"LOGAN" manufactures a complete line of air and hydraulic operated Chucks, in two, three and four jaw models, in Universal and Combination types, Compensating Chucks, Finger Chucks, "Two-in-One" Chucks, Parallel Grip Collet Chucks, Indexing Jaw Types, and Drill Press Chucking devices.

"LOGAN" engineers will be glad to make specific recommendations on your chucking problems. Send us your specifications. The "LOGAN" Chuck Catalog (No. 70—Sec. 1) will be sent on request.



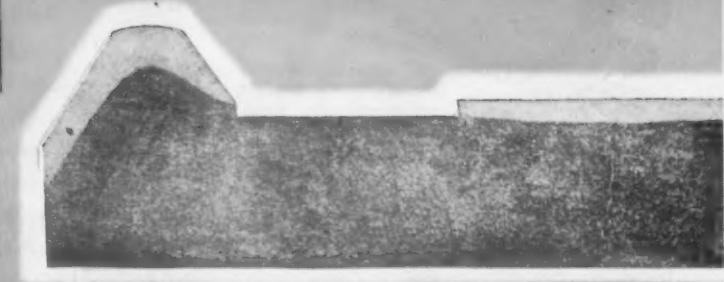
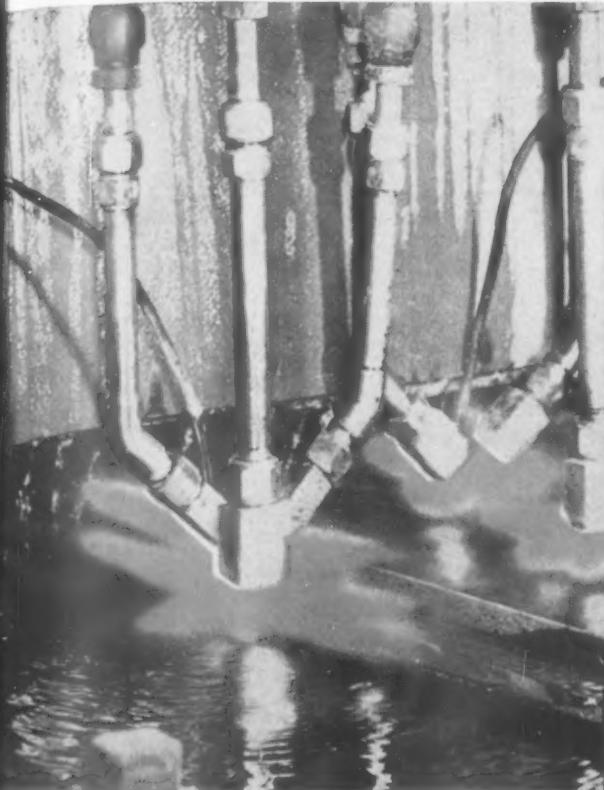
LOGANSPORT MACHINE CO., INC.
902 Payson Road, Logansport, Indiana

"LOGAN" Air and Hydraulic Equipment

CHUCKS * CYLINDERS * VALVES * PRESSES * SURE FLOW COOLANT PUMPS

Bedway accuracy maintained

BY MONARCH FLAME-HARDENING



Even though subjected to grueling service during wartime, the flame-hardened bedways of Monarch Lathes will retain their accuracy for peacetime operations.

The flame-hardening process was first adapted to machine tools by Monarch, in 1937. Since then, more than 18,000 Monarch Lathes with flame-hardened bedways (as well as many other important surfaces) have proved the practical value of this method. It gives cast-iron bedways a hardness equal to that of hardened steel, yet preserves the valuable qualities of the microscopic particles of graphite. Among other advantages, graphite provides a lubricative property to cast-iron sliding surfaces that is not found in steel. Thus bedway accuracy is maintained even under the most severe use.

The inset illustration is a full-size, unretouched photograph of a section of bedway from a Monarch Lathe and shows the depth of the hardening through which are distributed these graphite particles. A bulletin describing the process will be sent upon request. Ask for Bulletin No. 194.

Flame-hardening is but one of many outstanding developments in lathe design which have been made by Monarch. The same progressive engineering which has built Monarch's reputation in the past can be depended upon to maintain Monarch leadership in the future.

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

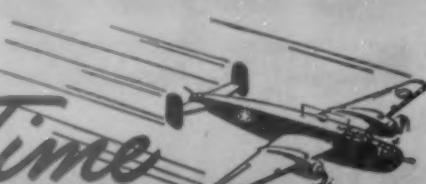
DIRECT FACTORY BRANCHES AT

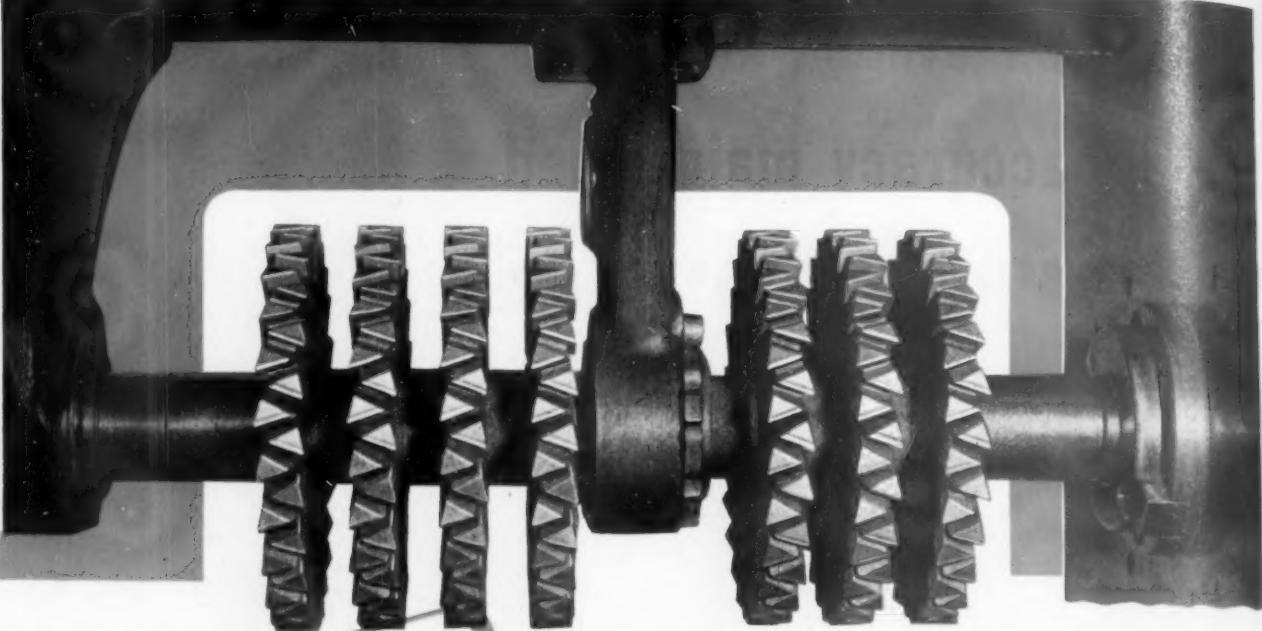
801 Fisher Bldg., Detroit 2, Mich. • 10465 Carnegie Ave., Cleveland 6, Ohio
622 W. Washington Blvd., Chicago 6, Ill. • 1060 Broad Street, Newark 2, N.J.

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Representatives in principal cities

Monarch Saves Time





ANOTHER EXAMPLE OF
BARBER-COLMAN
CUTTER PERFORMANCE



Above, cast steel brake shoe, showing slots to be milled in both ends. Below, sequence fixture used on this job.



B-C HERRINGBONE CUTTERS SOLVE DIFFICULT MILLING PROBLEM

Trouble on this job was caused by irregular *very hard* spots in the castings; so hard and so many that previous cutters shed teeth all too frequently — until they put on this gang of *Barber-Colman Herringbone Type Cutters* shown above. These pieces are cast steel brake shoes, with 3 slots to be milled in one end and 4 in the other. The fixture used is shown below. Each slot is $27/32"$ wide and $1-3/4"$ deep. Stock removal averages $1/4"$ and may run up to $3/8"$. Using a plunge cut, customer obtains 6 completed pieces per hour and from 187 to 220 pieces per grind of the cutters. B-C Cutters have proved, time and again, that they can overcome difficulties on troublesome jobs — which makes them all the more reliable for the ordinary run of work. *For durability and dependable performance, use Barber-Colman Milling Cutters.*

Buy
War
Bonds

Barber-Colman Company

GENERAL OFFICES AND PLANT • 105 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.





EVER WEIGH UP A PACKAGE OF

Diamonds?

This ingenious little scale (which folds up and fits comfortably into the coat pocket) is a familiar sight on the desk of many a production man, purchasing agent and grinding room superintendent. It is part of the Wheel Trueing man's kit when he is showing the fine industrial diamonds for which Wheel Trueing is famous.

If you want to weigh up some of the stones, this little balance will give you the answer down to a hundredth of a carat or up to two hundred carats at a time. And, many thousands of carats of Wheel Trueing diamonds pass over these scales in the course of a year.

For, there are still plenty of diamond users who like to buy their diamonds unmounted and have been buying them that way from Wheel Trueing for more than a third of a century. And, there are many who have come to know Wheel Trueing so well that they leave the matter of selecting their diamonds entirely in our hands.

Wheel Trueing sales offices, located throughout the country, are equipped to show you splendid selections of the finest quality industrial diamonds and to give you the benefit of wide experience in the use of diamonds.

Your inquiry will receive prompt attention.

Send for a copy of our booklet "Tips on Using Diamond Tools." Every diamond tool user or operator should have one.

WHEEL TRUEING TOOL COMPANY

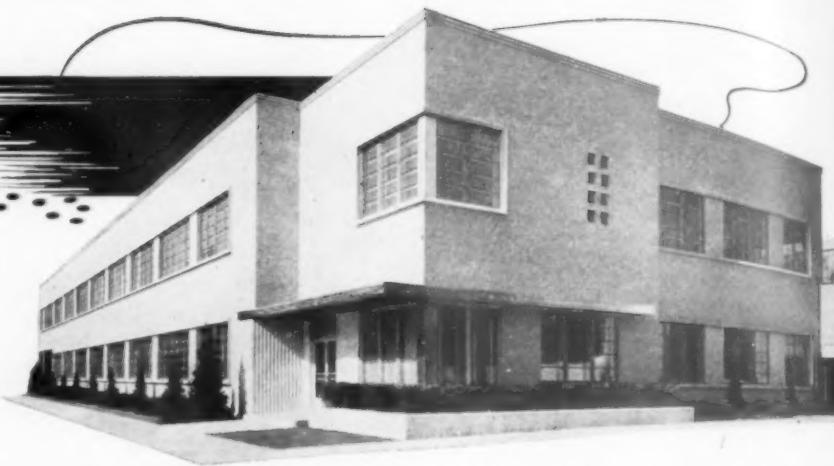
3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada

HEADQUARTERS FOR

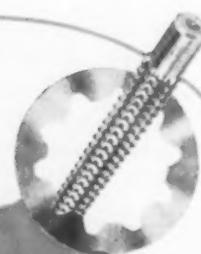
"ENGINEERED"

CUTTING TOOLS



**WHERE THE *Unusual* IS INVITED...
UNDERSTOOD AND SOLVED!**

New product designs, lighter metals, new alloys and machine tools with increased feeds and speeds combine to create unusual and complex cutting tool design requirements. Illinois Tool engineers and metallurgists can bring to such problems a vast experience and unmatched facilities for the development and production of special tools that will exactly meet your needs. Consult an Illinois Tool engineer... you will find him capable of understanding and solving your difficult tooling problems.



**ILLINOIS
TOOL WORKS**

2501 North Keeler Avenue • Chicago 39, Illinois
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

Overnight to All America...
From The Hub of Air Transportation



A New Way to Cut Burring Costs

BEFORE BURRING

Sheet Alclad 1" to 60" wide automatically burred at maximum surface feed of 200 feet per minute . . .

Burrs ALL METALS from .020" to .250" thick

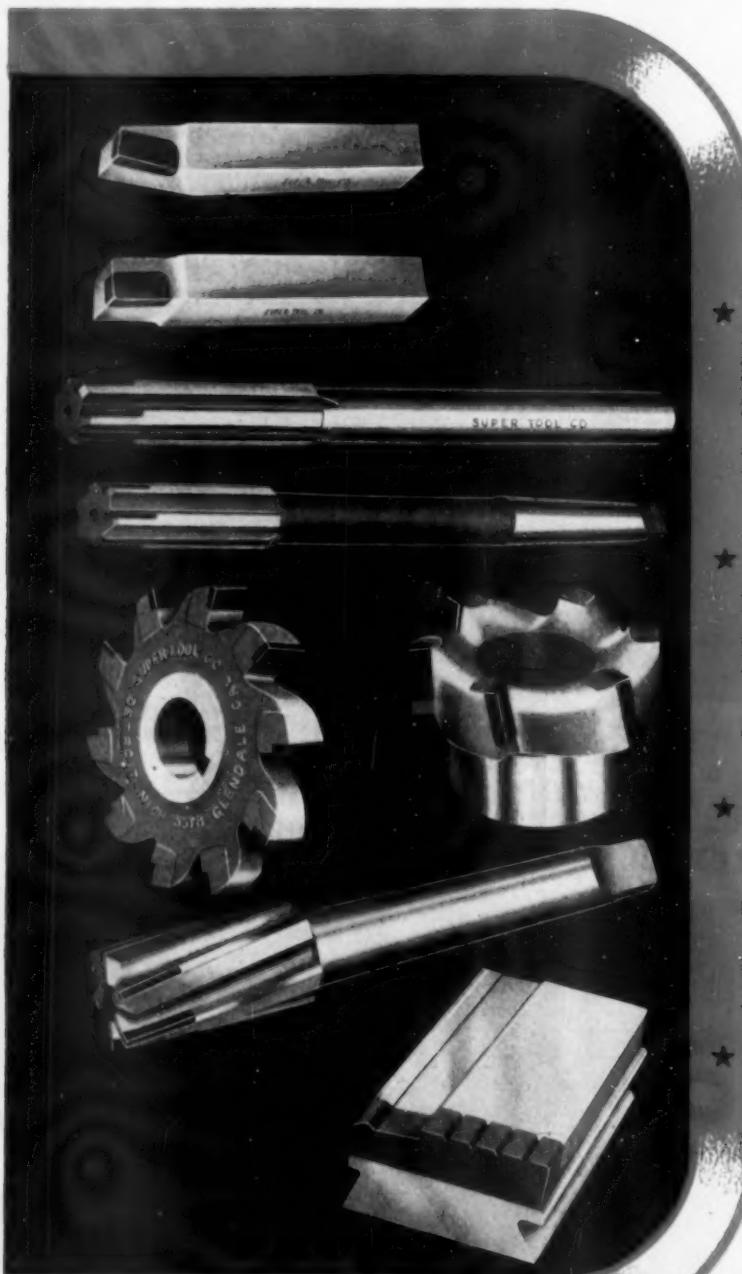
AFTER

Yoder
BURR-PLANER

A simple automatic machine which cuts burrs to within .001" to .005" . . . rolls down balance . . . leaves holes in working condition after one pass. Savings in time as high as 85% have been made in aircraft work, where it has been thoroughly production-tested. Prompt deliveries. Write for descriptive bulletin.

THE YODER COMPANY
5500 WALWORTH AVE. • CLEVELAND 2, OHIO

SUPER TOOLS...



**FOR
SPEED and ACCURACY
ON EVERY
CUTTING JOB**

★ **CARBIDE TIPPED TOOL BITS**

For turning, boring or facing these single point tools are extremely efficient when machining all materials including hard steels. They cut fast, clean and true. Low heat absorption means less pitting when cutting soft steels.

★ **CARBIDE TIPPED STANDARD REAMERS**

These extremely fast, true and clean cutting solid type standard reamers are available with either a straight or tapered shank. They have proved their ability to hold their size over long runs on all types of reaming jobs.

★ **CARBIDE TIPPED MILLING CUTTERS**

For faster production, greater accuracy and money-saving economy on all types of milling jobs—cast iron and non-ferrous materials as well as steel. The low cost of these milling cutters permits their use on short as well as long runs.

★ **CARBIDE TIPPED SPECIAL TOOLS**

The wide experience of Super Tool engineers is backed by unequalled laboratory resources for creating special tools to meet your specific production needs. Super special tools are speeding production in hundreds of war plants. Send us your prints and specifications for recommendations and estimates.

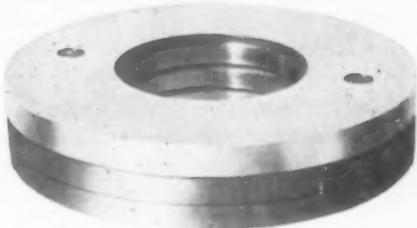
SUPER Tool Company
Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

How **One Plant** Solved the Tool Steel Selection Problem

PRODUCTION BOTTLENECK BROKEN

A prominent metal parts manufacturer first became acquainted with Carpenter Matched Tool Steels because of a tool-caused production bottleneck. A shaving die used in a punch press operation wore rapidly and would not hold size. An oil-hardening steel had been tried but it lacked the necessary wear resistance. When Carpenter Hampden was selected for its maximum wear resistance and accuracy in hardening, production was increased from 99,600 to 504,000.



BREAKAGE ELIMINATED

After the first successful experience with Carpenter Matched Tool Steels, the tool room tackled another job. A staking punch used to stake nuts on a spindle had a short life that averaged 40 hours. The oil-hardening steel used, either failed by breakage when treated for maximum hardness, or battered out of shape when drawn for greater toughness. No. 11 Special, a tough timbre, straight carbon water-hardening steel, was tried with excellent results. Punch life went from an average of 40 hours to more than six months service, and punch was still in good condition at the end of that time.



TOOL LIFE UP 66%

Confidence in solving tool problems with Carpenter Matched Tool Steels increased with results and inspired a search for improved performance on other jobs. High speed steel had been used for a burnishing punch. The selector section in the Carpenter Matched Tool Steel Manual recommended K-W (Water-Wear) for burnishing tools. The slick glass-hard surface provided by K-W gave a smoother, cleaner finish and tool life was increased 66%.



Lower Unit Costs and Increased Output Result from Carpenter Matched Tool Steels

These examples show how Matched Tool Steels provide an easier method of selecting tool steel to meet specific requirements, or to get improved results.

Many plants have discovered that this method of tool steel selection has many advantages—protection against hardening failures and premature service failures—greater freedom from tool troubles and very substantial increases in the service life of tools. If you are looking for a chance to lower unit costs and increase output, re-examine your tooling problems now with the help of the Carpenter Matched Tool Steel Manual. Write on your company letterhead, giving title or position, for your copy of this helpful 168-page manual.



**Carpenter
MATCHED
TOOL STEELS**

THE CARPENTER STEEL CO., 122 W. Bern St., Reading, Pa.

NOVEMBER, 1944

Making broaches comes pretty close to being a

Fine Art

There is no branch of tool making that requires as much actual first-hand experience as the design and manufacture of accurate and dependable broaches. Seemingly, negligible factors often result in large differences in the effectiveness and the life of the broach. Very seldom are any two broach problems just alike and only the broach organization with wide experience is capable of evaluating all the factors which enter individual broaching problems.

For maximum economy and effectiveness, let such an organization supply your broaching tools.



SPECIALISTS ON SPUR AND HELICAL
INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS



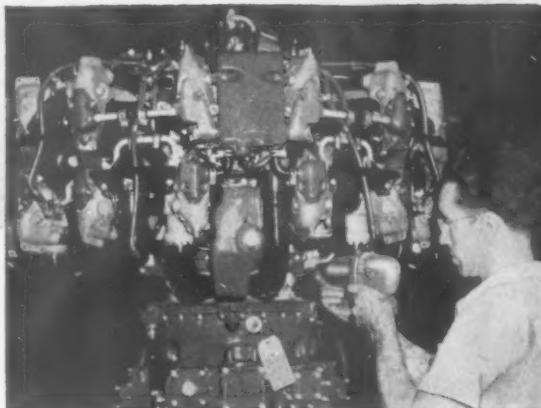
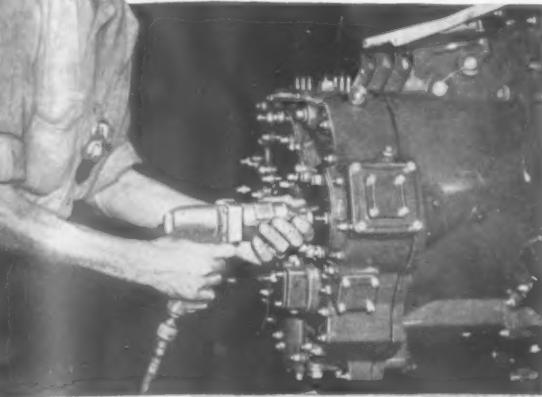
**NATIONAL BROACH
AND MACHINE CO.**

RED RING PRODUCTS
5600 ST. JEAN • DETROIT 13, MICH.



FASTESt AND EASIEST

APPLY AND REMOVE NUTS
THE *Impact* WAY



The Ingersoll-Rand air-operated Impact Wrench is one of the most useful portable power tools ever invented. A unique impact unit changes torque from the "Multi-Vane" air motor into fast "rotary impacts" that are transmitted to the nut. A few minutes observation of this machine on nut running will prove that it does the seemingly impossible—it delivers high torque to the nut without noticeable kickback to the hands of the operator.

There are five sizes—all smooth and speedy—all reversible—and they will apply or remove nuts from bolts up to $1\frac{1}{4}$ inches in diameter.

By using the Impact Wrench a saving in *man-hours* is realized—hours that can be used for other important operations that are so necessary during these critical times.

Other operations that can be improved by using Ingersoll-Rand Air Tools are: DRILLING, REAMING, TAPPING, CHIPPING, GRINDING, RIVETING, CALKING, HOISTING, etc.

Ingersoll-Rand

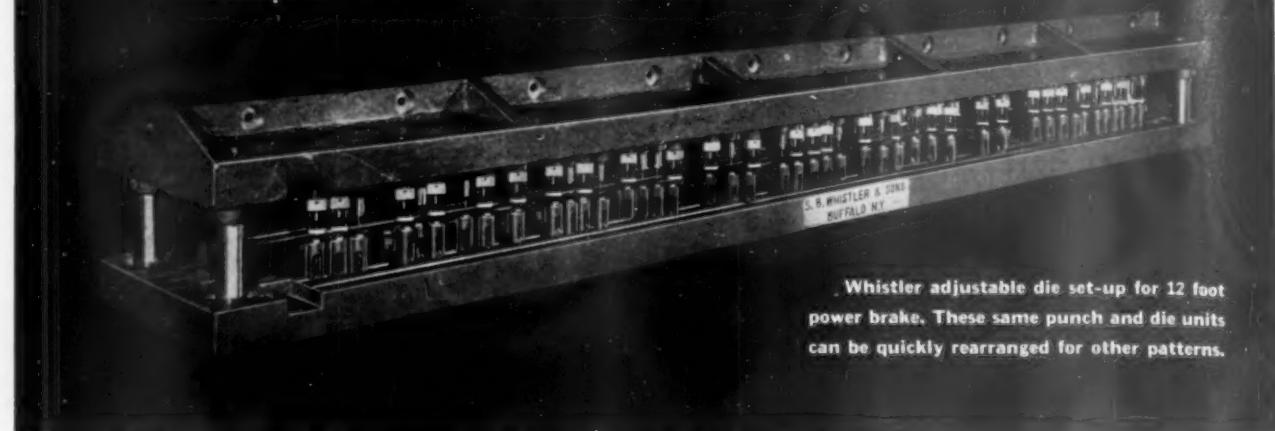
11 BROADWAY, NEW YORK 4, N. Y.

8-453

COMPRESSORS • TURBO BLOWERS • ROCK DRILLS • AIR TOOLS • OIL AND GAS ENGINES • CONDENSERS • CENTRIFUGAL PUMPS

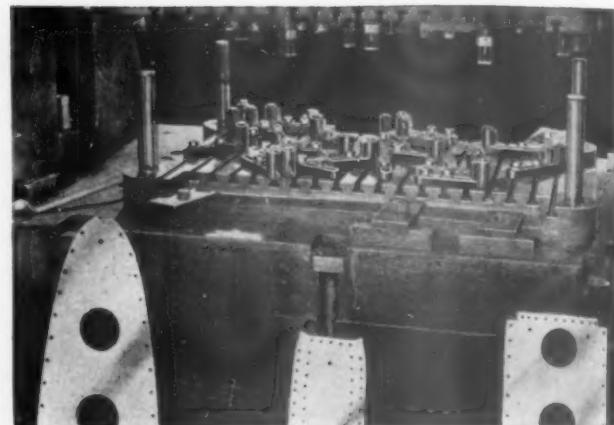
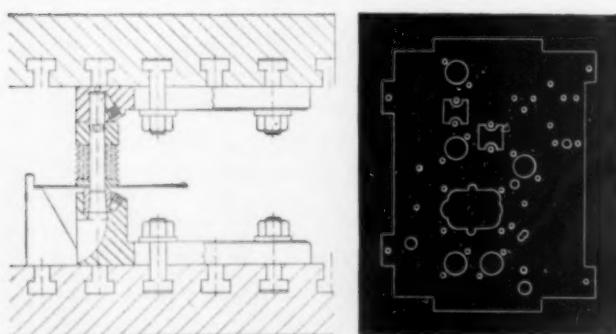
ADJUSTABLE DIES SPEED WAR PRODUCTION

INCREASE HOURLY PRODUCTION—REDUCE “DOWN” TIME



Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.

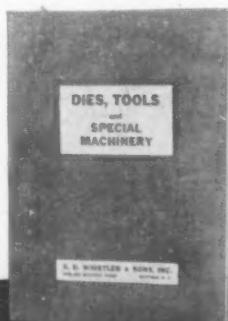


Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.

Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.
752-756 MILITARY ROAD
BUFFALO, N. Y.



Every Production Executive
needs this fully illustrated
catalog. Sent upon request.

How to make a hand-operated drill press an automatic production unit in 10 minutes!

A BELLOWS Controlled Air-Power Drill Press Feed, synchronized with a Bellows Controlled-Air Vise, brings automatic operation to standard drill presses in a matter of minutes.

The Bellows Drill Press Feed, at the touch of a handle, advances the tool through the work at a precise and exactly controlled rate — and automatically returns the tool to starting position. Ample cushioned power, perfectly controlled, eliminates tool shock — means longer tool life, more accurate tolerances.

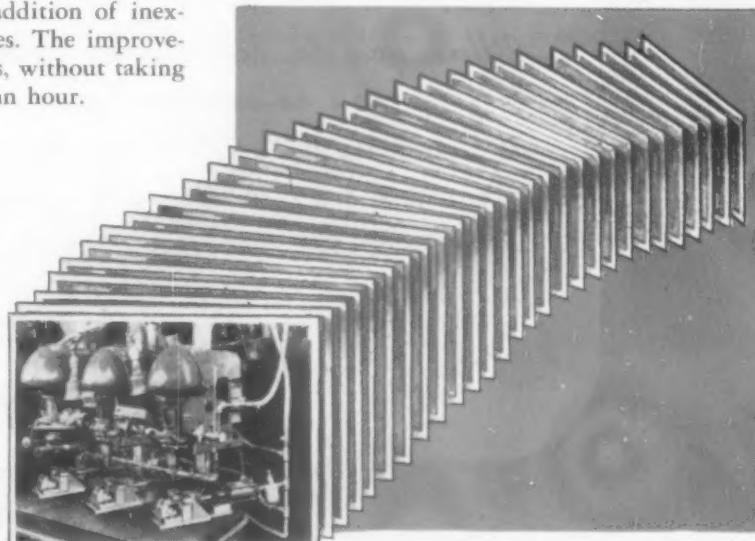
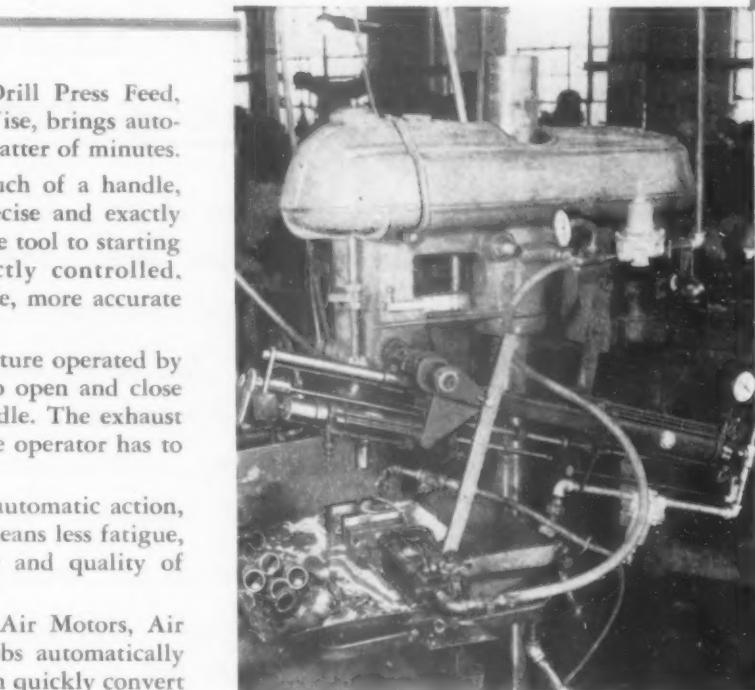
A Bellows Air Vise, or a custom made fixture operated by a Bellows Air Motor, may be synchronized to open and close automatically with the movement of the spindle. The exhaust air may even be used to eject the part! All the operator has to do: insert the work, push the handle.

Not only is production increased by the automatic action, but the reduction in operator physical effort means less fatigue, less accident hazard, more uniform quantity and quality of production.

Bellows Controlled Air-Power Devices: Air Motors, Air Feeds, Air Vises — are doing hundreds of jobs automatically that were formerly done by hand. You, too, can quickly convert hand operated drill presses, millers, grinders, and other machine tools to automatic production units by the addition of inexpensive Bellows Controlled Air-Power Devices. The improvement can be made by your own tool engineers, without taking equipment out of production for more than an hour.

SEND FOR THIS
New-Free
PHOTO-FACTS FILE

Twenty-five 8"x10" photographs showing interesting applications of Bellows Controlled Air-Power Devices in leading plants all over America — together with a record of production accomplishments, installation costs. Send for your free copy, today!



The Bellows Co.
ESTABLISHED 1911
AKRON 10, OHIO



Reconversion Must Not Mean "Going Backwards"

Remember pre-war days, when you could never be quite sure how carbides would work out on a steel cutting job?

War has taught Industry many things. Not the least of these is how to use carbides to cut all kinds of metals and cut them faster and at lower cost.

That's a good point to remember when you pull out your pre-war prints to start tooling up again to build autos, trucks and refrigerators.

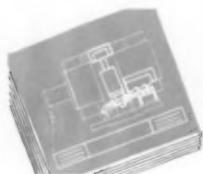
When you do, call on our field engineers to help you re-convert "forward" instead of "backwards". TCT has been designing carbide tools "to the job" since 1928—when carbides were first produced in this country.

TUNGSTEN CARBIDE TOOL
Company

2661 Joy Road, Detroit 6, Michigan



The ABC's of Versatility WITH HEALD BORE-MATICS



THE OPERATION — All types to suit your requirements

Bore-Matics are all-purpose tools, readily adaptable for boring, turning, facing, chamfering or grooving. Straight or taper surfaces can be machined, also curved and irregular shapes. These operations can be performed singly, simultaneously, progressively or in combination, in finishing, semi-finishing or roughing cuts.

THE MACHINE — Basically adaptable to all jobs

Basic design of Bore-Matics has unusual versatility permitting individual arrangement to suit every job—like slotted bridges holding one or more boring heads—flexible, adaptable drive to heads by V-belts—single-end or double-end bases—variable hydraulic feeds—hydraulic power for auxiliary attachments and clamping—and manual or automatic cycles.



THE TOOLING — Get maximum cutting efficiency

Possibilities of tooling arrangements on Bore-Matics are almost limitless. Single-point, broad-nose and form tools can be employed, either rotated by quills, fed radially by rotating tool slides, or given contour movement for irregular surfaces. Tools also can be mounted on the table, on cross-slides or angular slides, and on rotary tool blocks. Arrangements are also available for tool indexing and retraction.

THE FIXTURES — Get faster, better chucking

Widely diversified methods of work holding are available on Bore-Matics. Work can be chucked in rotating fixtures, between centers, or in stationary fixtures. Rotary-indexing fixtures, horizontal or vertical types, can also be furnished. When required, fixtures can be mounted on cross-slides for indexing or retraction from tools. Hydraulic, pneumatic or manual clamping is available.



HEALD Bore-Matics

THE MOST VERSATILE MACHINE TOOL

At Right: Small shutter parts being honed on Sunnen "MA" Precision Honing Machine.

Below: Navy photographer using Fairchild FS6 Aerial Camera with 8½" focal length for oblique photography.



Precision-Built
FAIRCHILD
Aerial Cameras

The bulk of the aerial cameras, which make accurate aerial photography possible, is manufactured by the Fairchild Camera & Instrument Corporation. These versatile cameras, of various sizes and models, take aerial photographs from heights ranging from tree-top to 40,000 feet, either at day or night, and under extremes of temperatures, atmospheric and combat conditions. Fairchild aerial cameras range in weight from 11 pounds to 200 pounds, and each is designed for uses as required by the Army and Navy Air Force. Although these cameras are rugged enough to withstand all operating conditions, they must also be compact and precision-made.

SUNNEN PRODUCTS CO., 7932 Manchester Ave., St. Louis 17, Mo.
Canadian Factory: Chatham, Ontario

SUNNEN

Typical Jobs



Aircraft Hydraulic Brake Cylinder. Honed 3 times faster than lapping — and gave a straighter hole.



Aircraft Valve Top-pet Roller. Honed after grinding to give 100% bearing surface.



Aircraft Carburetor Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.



Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



ACCURACY IN ACTION!

— made possible by
SUNNEN HONING

For high precision work on small vital parts such as segments for camera shutter leaf centers, cam pawls, pallets, ratchet wheels, and bushings, Fairchild uses Sunnen honing.

After grinding, these parts are honed to extreme accuracy — often within .0001". The inside surfaces of these diameters must be polished to a super-smooth finish to reduce friction on bearing surfaces — for these parts must operate faultlessly at temperatures from -70° F. to 165° F.!

Here again is real tribute to the amazing accuracy and super-smooth finish made possible by Sunnen honing.

Remember — the Sunnen Model "MA" Precision Honing Machine handles any diameter from .185" to 2.625" with a guaranteed accuracy of .0001" and a finish of 2 to 3 micro inches.

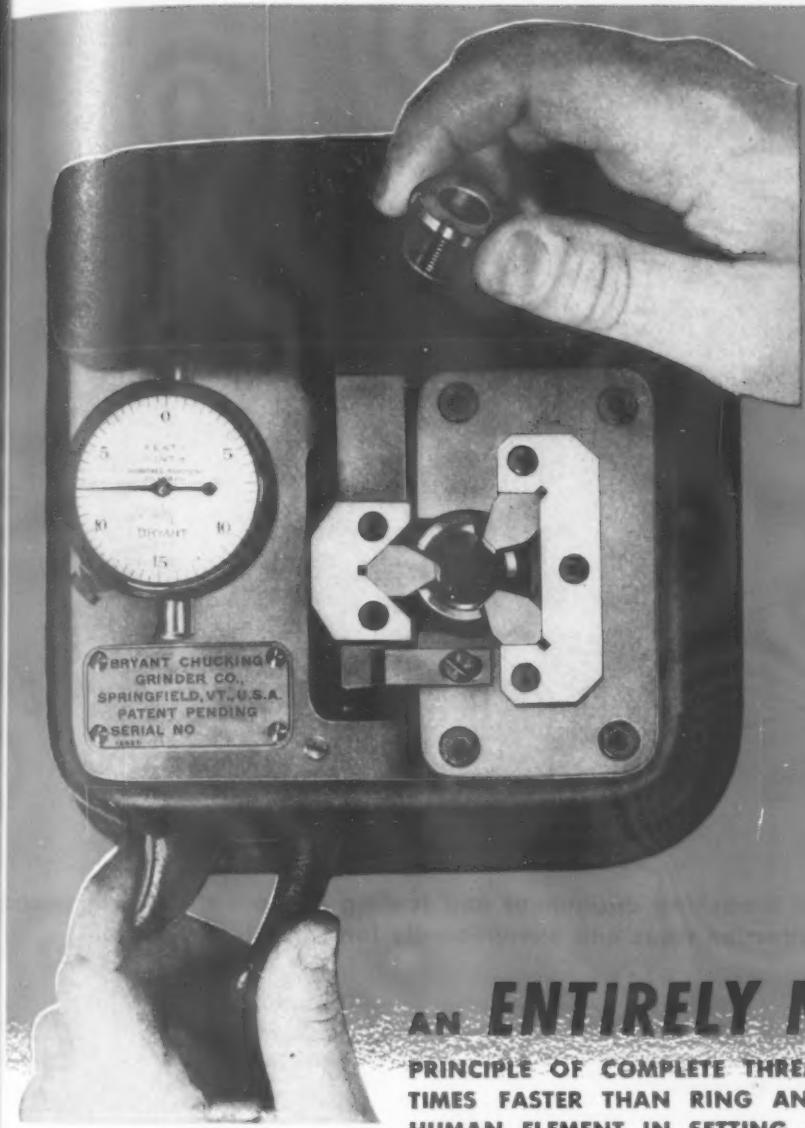
Write for new bulletin giving complete information!



The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.



THE TOOL ENGINEER



BRYANT THREAD GAGES

AN ENTIRELY NEW

PRINCIPLE OF COMPLETE THREAD INSPECTION THREE TO FOUR TIMES FASTER THAN RING AND PLUG GAGING—ELIMINATING HUMAN ELEMENT IN SETTING GAGE WITH MASTER PLUG AND DURING INSPECTION OF WORK PART.

- ★ One unskilled operator replaces four or five skilled inspectors.
- ★ Gives complete over-all inspection in a few seconds.
- ★ Thread segments have many times the life of ring and plug gages.
- ★ Master gage accuracy transferred quickly to production parts.
- ★ Available in three standard models.
(Special sizes on request.)

The NEW BRYANT THREAD GAGE checks the entire circumference of internal and external threads in a few seconds. The operator merely drops the part on the work rest, releases the control lever, and gives the work a partial turn only. The dial reading shows the accumulated inaccuracies in lead, taper, pitch diameter, thread form, and the presence of burrs or surface inaccuracies.

The Bryant Thread Gage makes it possible—as never before—to transfer the measurements of master thread gages accurately and quickly to the parts being produced—it eliminates tedious, slow, and expensive methods requiring skilled inspectors. Write today for illustrated folder No. G2 which gives complete details.



BRYANT CHUCKING GRINDER COMPANY

SPRINGFIELD, VERMONT, U. S. A.



*Figure it
out for
yourself*

BROACHING Means Lower Cost PER PIECE

CAPITAL INVESTMENT

The slightly higher cost of broaching equipment and tooling is more than compensated for by extremely high production rates and exceptionally long tool life.

LABOR

Completely unskilled labor is used on broaching machines. The operator has merely to load and unload the fixture. Greater machine efficiency also means fewer operators are needed to maintain production rates.

MAINTENANCE

The long life of broaches make the cost of sharpening them very low in relation to the number of pieces machined.

HANDLING

Broaching often makes it possible to combine several operations on one machine. It is possible, on certain types of parts, to cut on three sides of a part with one stroke.

SPACE

One broaching machine often has replaced as many as eight or ten machines of other types while increasing the production rate.

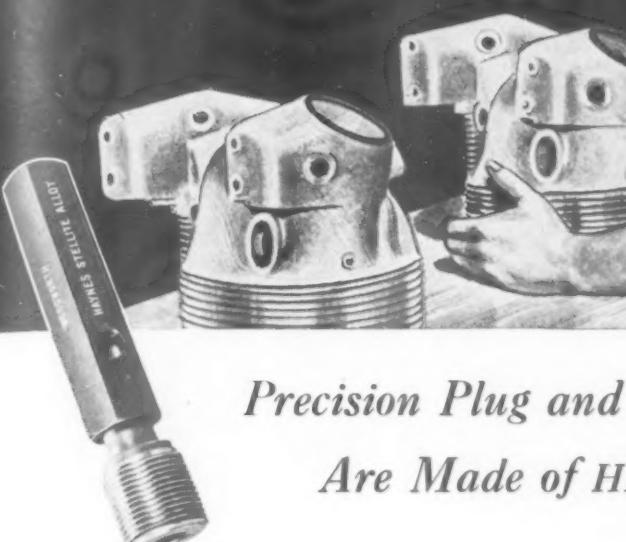
When you plan new tooling, call in a Detroit Broach engineer. Let him show you where broaching can give you more and better production at lower cost. Complete cost and production data will be cheerfully submitted without obligation.



DETROIT *Broach* **COMPANY**

20201 SHERWOOD AVENUE • DETROIT 12, MICHIGAN
9308 SANTA MONICA BLVD. • BEVERLY HILLS, CALIF.

Because They Remain Accurate Longer



Precision Plug and Thread Gages Are Made of HAYNES STELLITE Alloy

• HAYNES STELLITE alloy has been adopted by a leading gage manufacturer as the standard material for making precision plug and thread gages. This was done because wear tests proved that these gages will remain accurate and usable longer than those made from any of 18 other materials tested.

Because of their low coefficient of friction and their outstanding resistance to wear, abrasion, and corrosion, gages made of HAYNES STELLITE alloy keep their exact gaging sizes longer.

The same properties that make HAYNES STELLITE alloy the ideal material for precision gages are also important in many other products where a hard, tough, abrasion- and corrosion-resistant material is needed. Send for further information and let us help you with any application you have in mind.

Only HAYNES STELLITE Alloys Offer All These Advantages

1. They resist wear and abrasion.
2. They are inherently hard — even at red heat.
3. They retain their good mechanical properties at high temperatures.
4. They resist atmospheric corrosion and corrosive chemicals.
5. They take and keep a high polish.
6. They have a low coefficient of friction.
7. They are practically non-magnetic.
8. They have a coefficient of expansion similar to that of steel.
9. They can be supplied in the form of castings, small sheets, and welding rod.



HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

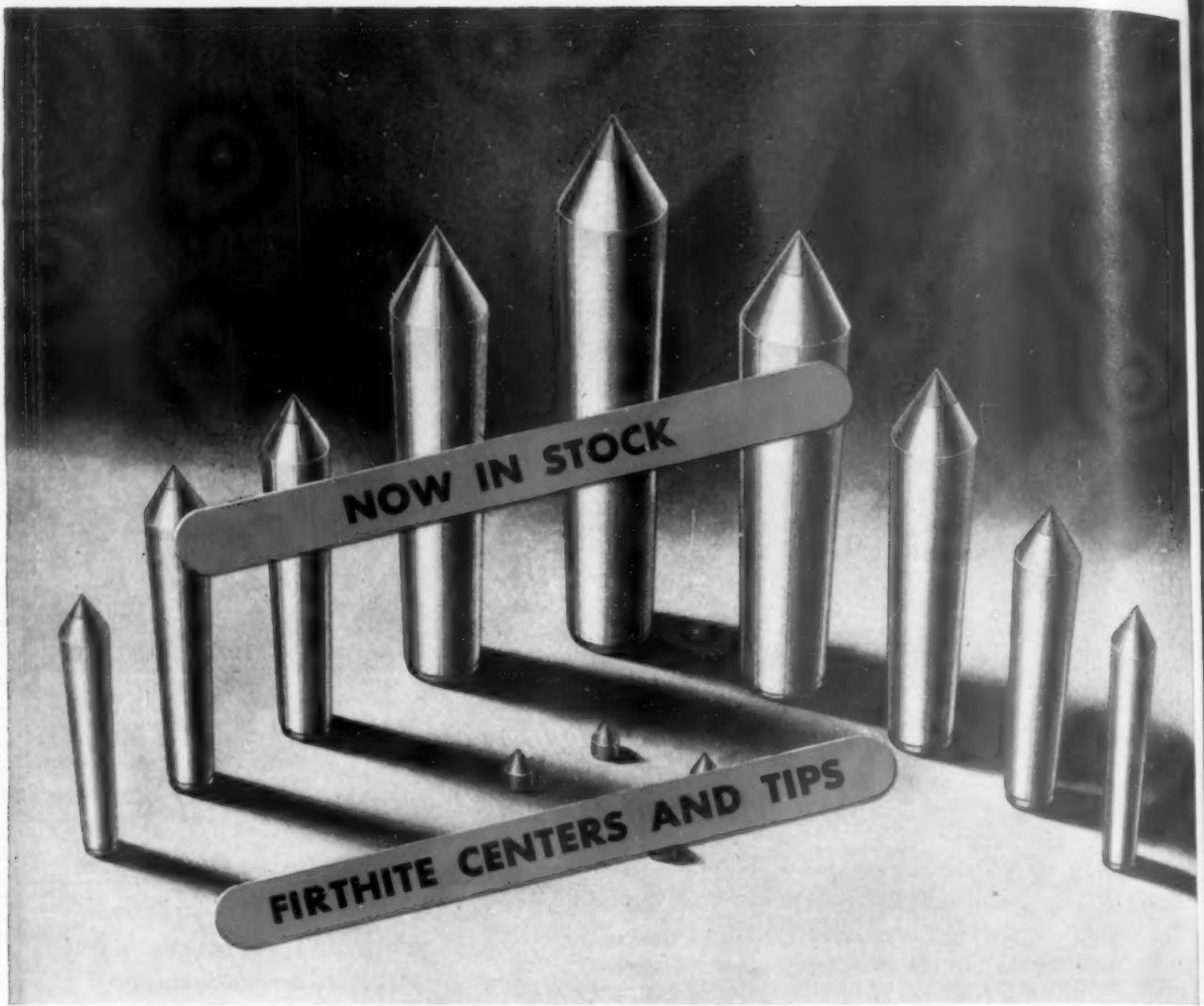
New York 17, N. Y. U.S.A. Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

RED-HARD, WEAR-RESISTING ALLOY OF COBALT, CHROMIUM, AND TUNGSTEN.

"HAYNES STELLITE" is a registered trade-mark of the Haynes Stellite Company.

NOVEMBER, 1944



for longest wear use *Firthite*

Whether you buy finished centers or carbide tips for making your own, you can now obtain immediate shipments of FIRTHITE from complete stocks. Finished FIRTHITE Centers

are available with three tapers—Morse, Jarno, or Brown and Sharpe. To secure the maximum resistance to wear, or long life, specify **FIRTHITE Grade T-41**—"tops" for centers.



Firth-Sterling
STEEL COMPANY

OFFICES: MCKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA PITTSBURGH DAYTON DETROIT

VIEW

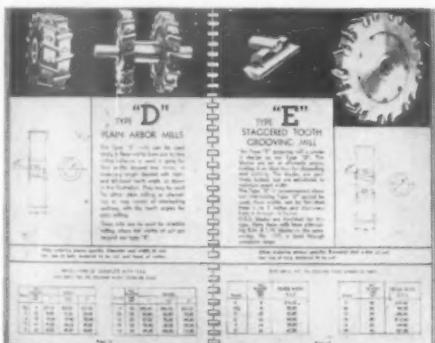
LOVEJOY TOOL CATALOG

The new Lovejoy Tool Catalog is just off the press—your free copy is waiting for you—it is filled with photos, specifications, line drawings, prices, part numbers, hints on grinding, proper cutting speeds, etc., etc.

It gives complete information on all Lovejoy inserted-tooth type cutting tools, plus standard arbors and mountings.

Just fill in the handy coupon and mail it today!

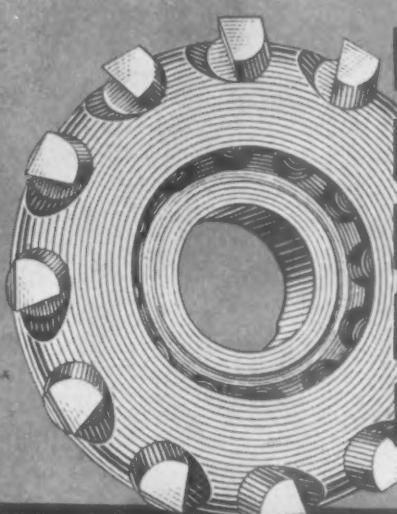
There are 38 pages packed with illustrations and information like this!



LOVEJOY

MODERN METAL CUTTING

TOOLS



MILLING CUTTERS

BORING HEADS, ARBORS
AND COUNTERBORES

SINGLE POINT TOOLS

BORING & FACING BARS

TURRET TOOL POSTS

LOVEJOY TOOL COMPANY Inc.
Springfield, Vermont, U.S.A.

MAIL THE COUPON TODAY !

Please send me my free copy of "Lovejoy Modern Metal Cutting Tools."

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TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.





Cleereman Jig Borer
producing a small
lot order at low cost.



Holes in this aluminum casting range
from No. 40 to 2 $\frac{5}{8}$ " dia.



+0.0003 -0

ON A *Cleereman* JIG BORER

Here is another example of low cost, small lot production on a Cleereman Jig Borer. The part is an aluminum drive casting in which 21 holes are finished, five being counterbored and two threaded. Without jigs or fixtures, tolerances on most of the holes are held to 0.0003, -0.0000.

You, too, can have the advantages of high efficiency, speed of operation, unexcelled accuracy, extreme range of adaptability, and long working life by installing Cleereman Machines.

Write today for catalogs on Cleereman Jig Borers, Cleereman Box Column Drilling Machines, and Cleereman Round Column Drilling Machines.

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Machinery & Engineering
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AFFILIATED WITH

CLEEREMAN MACHINE TOOL CO.

MANUFACTURER OF PRECISION
JIG BORERS & DRILLING MACHINES

2 SECONDS OF ARC—TWO PARTS IN

1,296,000...



. . . or less than .0006" error on the circumference of a ten foot circle. . . . The nearest approach to perfection ever devised for checking the spacing and angular location of gear teeth, master index plate notches, splines or any other form of circular division. . . . A positive method for locating those minute errors whose accumulated total means costly adjustment and low production. . . . A rugged, sturdy inspection instrument that is an essential wherever precision production is maintained. THE VINCO MASTER INSPECTION OPTICAL DIVIDING HEAD.

Complete details furnished on request.

VINCO CORPORATION, 8857 Schaefer, Detroit 27, Mich.
SALES OFFICES: NEW YORK, CHICAGO, CLEVELAND

MILLIONTHS OF AN INCH FOR SALE BY **VINCO**

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius-Dresser
• Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread
Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear
Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

Because They're Small They Have To Be Good

The smaller the grinding wheel, the more critical its quality. Each grain has all the greater responsibility. But small grinding wheels are more difficult to make than larger ones—it requires extra care to control consistency of the abrasives throughout each mounted wheel or point and from one to another. Bay State overcomes the difficulty by special manufacturing procedures which result in a better product, easier to use and with longer life.

Each Blue Flash mounted wheel or point is turned down from a large blank, and is sized and shaped on its own mandrel. Thus, they

need no breaking-in period, because they are dressed as they are shaped.

run absolutely true, because each is concentric to its mandrel.

have no hard and soft spots, because the consistency of grain and bond is uniform throughout.

can be used right down to the mandrel, because the manufacturing process automatically provides a positive test for adhesion of abrasive to mandrel.

These advantages of Blue Flash Mounted Wheels and Points are typical of what you can expect from the entire Blue Flash line. Into each type of product, Bay State builds *extras* that can be easily appreciated when on the job. Write for literature on the products you use—including the handy, pocket-sized catalog on mounted wheels and points.

**BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.**



BLUE FLASH GRINDING WHEELS *FAST and COOL*



GRINDING WHEELS



HONING AND SUPERFINISHING STONES



PORTABLE SNAGGING WHEELS

MOUNTED WHEELS



T AND POINTS



CUT-OFF WHEELS



INSERTED-NUT DISCS



AND CYLINDERS



THE TOOL ENGINEER



NICKEL ALLOYS AID THE CHEMICAL INDUSTRY to KEEP 'EM PRODUCING!

Stainless Steel Lined Polymerization Reactors in Synthetic Rubber Plant

Equipment of Stainless Steel, Nickel and Monel meets many specialized requirements

Chemical engineers have met America's wartime challenge.

They opened the gates to a mighty flood of products going to war...strategic raw materials, synthetic substitutes, and entirely new substances having advantages all their own.

A factor in this production success is the wide use of stainless steel, Monel, and other corrosion-resistant alloys containing Nickel.

For in the chemical industry corrosion is a large-scale menace.

To wage war on this enemy, chemical engineers enlisted the aid of Nickel, because Nickel imparts to other metals strength and resistance to corrosion and wear. In the chemical field, as in many

others, a little Nickel goes a long way to keep equipment producing.

It prolongs the life of processing apparatus, and protects the purity, color, and uniformity of the product.

Hence, stainless and Nickel alloys are specified widely for acid heaters and caustic coolers, for high-pressure autoclaves and vacuum evaporators, for cracking towers and polymerization reactors, for shipping drums and tank cars, for pumps, piping and storage tanks, for agitators and settlers, for stills and digestors—for every type of equipment that converts laboratory experiments into full-scale chemical operations.

For years we have enjoyed the privilege of cooperating with technical men

of the chemical industry...and of many others. Whatever your industry may be...if you want help in the selection, fabrication, and heat treatment of alloys...we offer you counsel and data.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects—from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?



* Nickel *

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

GET THIS

New South Bend Lathe CATALOG



MAILED ON REQUEST . . . WRITE TODAY FOR YOUR COPY!

SIZES AND TYPES OF SOUTH BEND LATHES

Engine Lathes — 9" to 16" swing, 3' to 12' bed length.

Toolroom Lathes — 9" to 16" swing, 3' to 8' bed length.

Precision Turret Lathes — $\frac{1}{2}$ " and 1" maximum collet capacity.

All sizes and types of South Bend Engine Lathes, Toolroom Lathes, and Precision Turret Lathes are clearly illustrated in color and described in this new catalog. Complete specifications including capacities, speeds, feeds, and weights are printed opposite the illustration of each lathe. All construction features, accessories, and attachments are also shown. Every user of machinery should have a copy of this catalog at hand for ready reference. Contains 64 pages, 11" x 8 $\frac{1}{2}$ " for standard file. Write today for your copy of Catalog 100-D.

Also, ask for details of our Post-War Priority Plan if you are now planning for the future. This will assure you prompt delivery when civilian production is resumed.

BUY WAR BONDS • SAVE FOR LATHES

SOUTH BEND LATHE WORKS



**LATHE BUILDERS FOR 38 YEARS
SOUTH BEND 22, INDIANA**



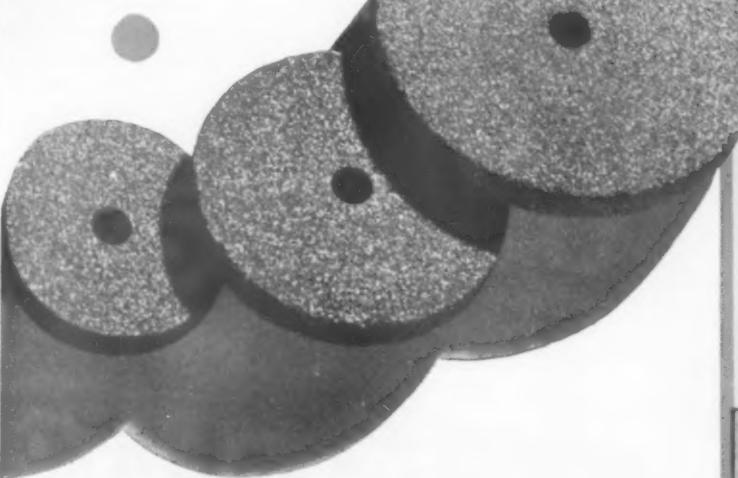
BONDED

with **Chicago** 
the Pedigreed Bond

It's the new bond that gives
the ultra smooth finishes you
get with Chicago Grinding
Wheels—

Precision finishes un-
dreamed of before—

Finishes so accurate that
you can measure them
in micro inches with a
Surface Analyzer.



Write for Catalog listing all Chicago products and
showing comparative photographs of finishes with
different kinds of Wheels.



CHICAGO WHEEL & MFG. CO.
Headquarters for Mounted Wheels and Small Grinding Wheels
1101 W. Monroe St., Dept. TE, Chicago 7, Illinois

* Half a Century of Specialization has established
our Reputation as the Small Wheel People of the
Abrasive Industry.

NOVEMBER, 1944

PERFECT FINISH INSURANCE

Whatever you have to finish—
metals, alloys, plastics, wood,
laminates or composition ma-
terials—you can do it better
with Chicago Wheels.

Chicago Wheels have kept pace
with the precision requirements
of our war industries, and
you can use them with confidence to finish
civilian goods better in double quick time.

CHICAGO GRINDING WHEELS

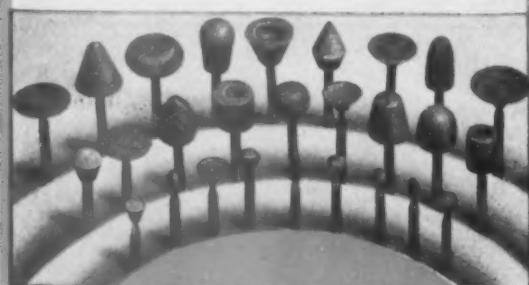
A wide range of grains and grades and—for
the duration—sizes up to 3" in diameter.

CHICAGO MOUNTED WHEELS

The first made and the finest today. In a selec-
tion of bonds, abrasives and shapes to handle
each job more efficiently.

TRY ONE FREE

We'll send without charge a Mounted Wheel
or an FV Bond Grinding Wheel. Tell us size
you'd like.



Send Catalog. Interested in

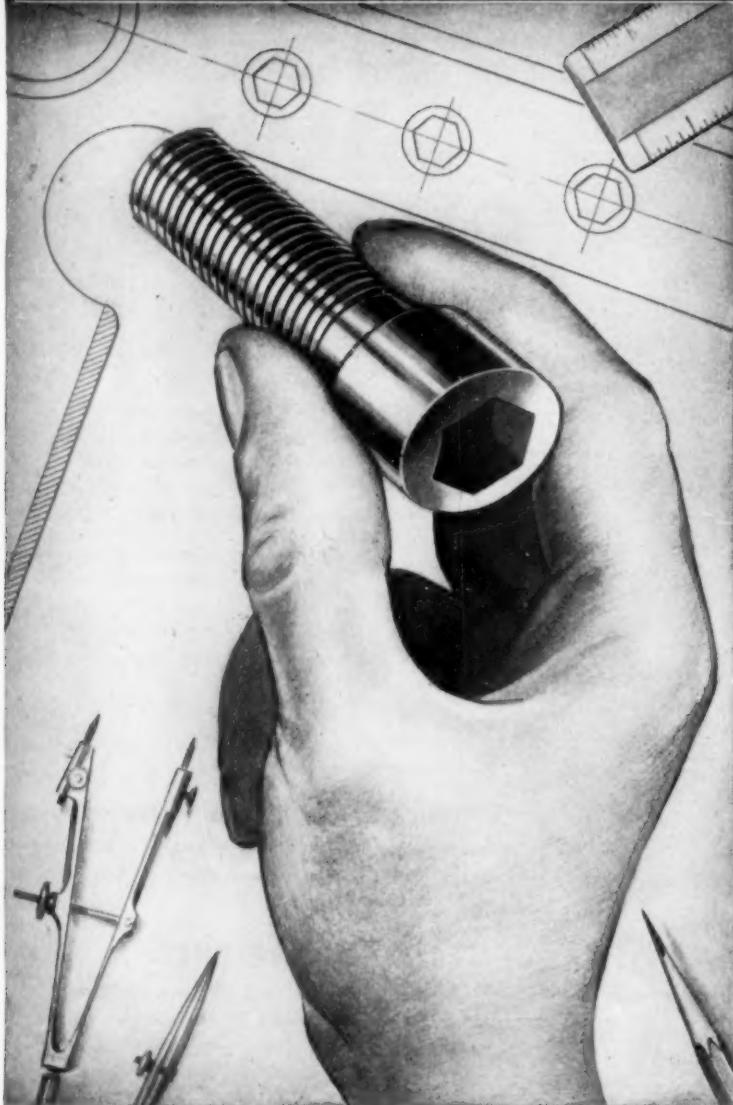
- Mounted Wheels. Grinding Wheels.
 Send Test Wheel. Size.....

Name.....

Address.....

TE-11

WHEN *Good Design* CALLS FOR **SOCKET SCREWS**
Good Judgment CALLS FOR
PARKER-KALON
Controlled Quality

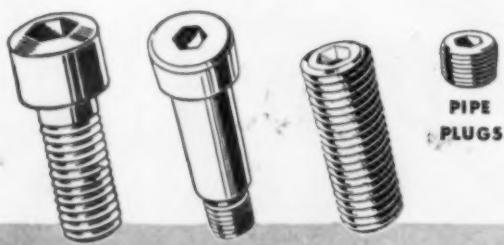


Whenever you specify Socket Screws, it is because you need strength, safety, compactness, or other advantages.

Since you use them when you need an *exceptional* fastening, it is good judgment to make sure you get Socket Screws of *exceptional* quality. At such critical points in your assemblies, you can't afford to have "doubtful" screws . . . screws that *look* all right, but some of which fail to *work* right.

Parker-Kalon's Quality-Control routine, unequalled in the industry, rules out "doubtful" screws by checking every mechanical and physical characteristic. Tests and inspections cover Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Torsion and Shear; Hardness; Head and Socket Size and Position; Thread Fit.

Specify Parker-Kalon Socket Screws next time you order . . . they cost no more. Parker-Kalon Corp., 208 Varick St., New York 14, N. Y.



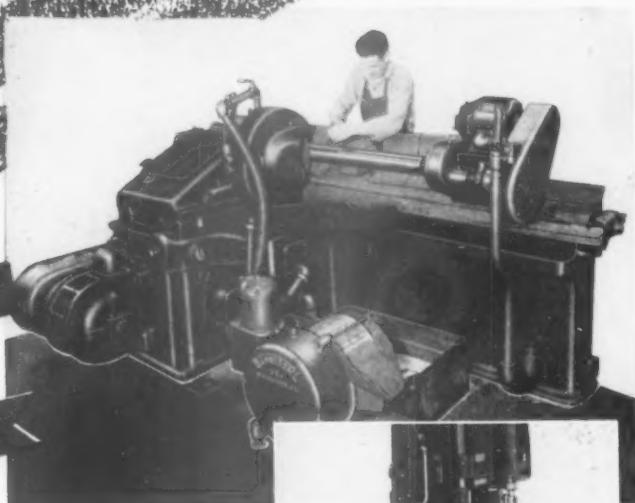
CAP SCREWS STRIPPER BOLTS SET SCREWS

PARKER-KALON
Quality-Controlled
SOCKET SCREWS

A product of **PARKER-KALON** . . . Specialists in Fastening Devices

*Announcing...
THE
NEW*

BARNESDRIL
*Magnetic-Automatic
COOLANT SEPARATOR*



(Above) Magnetic-Automatic Coolant Separator attached to cylindrical grinder. Upper chute scrapes off swarf and deposits it in removable pan. Lower spout shows clean coolant returning to reservoir.

New low cost method for automatically removing harmful metal particles from honing and grinding coolants . . .

It is no longer necessary to have costly filtering equipment to remove magnetic material from honing and grinding coolants. The new **BARNESDRIL** Magnetic Coolant Separator removes foreign matter automatically on a rotating magnetic drum. It can be started, stopped, or run continuously. Being entirely automatic, maintenance is reduced to a minimum. Because of this the honing or grinding machine operator can devote his entire time to productive work for there are no filters to clean, change or look after. Swarf that accumulates on the magnetic drum is automatically removed as the drum rotates. A chute carries it to a removable container, while a spout carries the clean coolant to the machine reservoir for recycling.

The Magnetic Separator is easy to install and can be used on any type honing machine or on some types of cylindrical grinders. There is no temperature rise of coolant flowing through Separator.

By removing magnetic metal chips and coarse abrasive particles from the coolant, there is little danger of marring or scratching finished work. As a result, finished workpieces are not rejected.

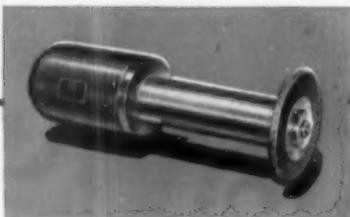
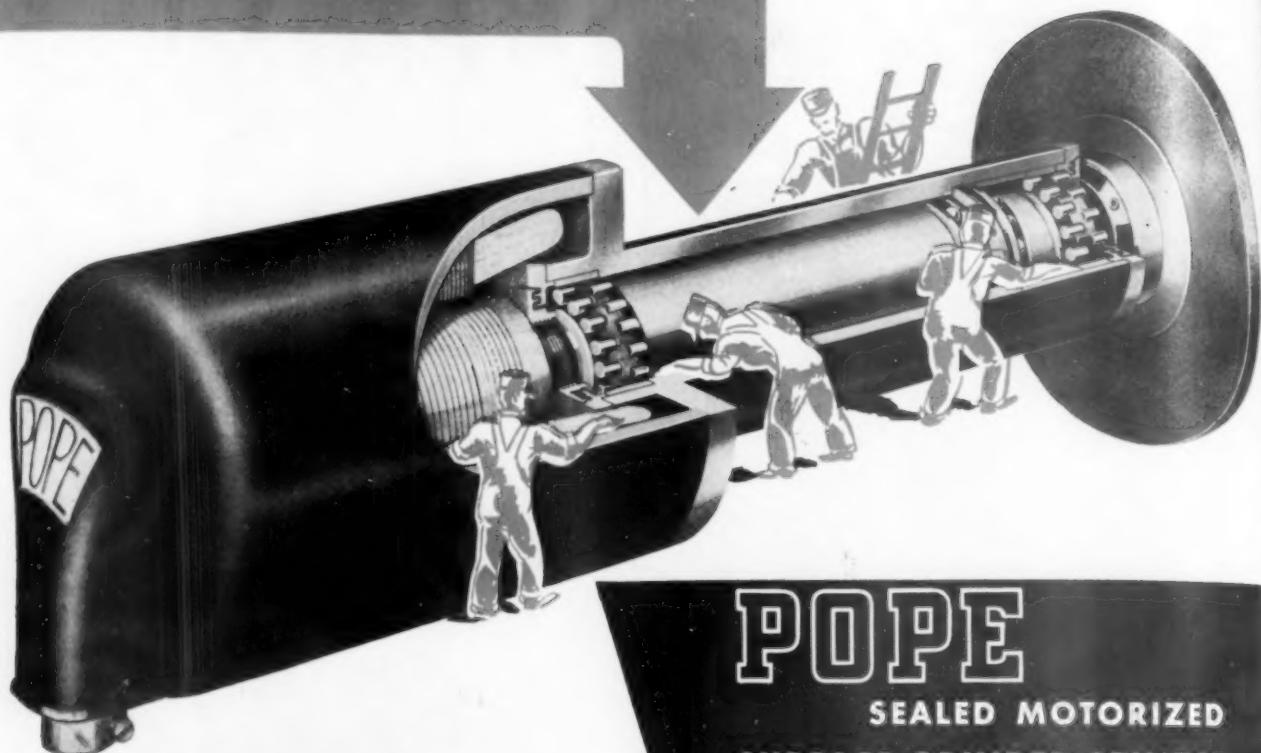


BARNESDRIL Magnetic-Automatic Coolant Separator on Vertical Honing Machine.

Complete Information on Magnetic-Automatic Coolant Separator is available in New Bulletin No. T-151. **BARNESDRIL** Engineers will gladly recommend the unit for your needs.

Barnes Drill Co. 848-71 CHESTNUT STREET
ROCKFORD
ILLINOIS, U.S.A.

LOOK INTO THIS . . .



Use this new and finer *Sealed Motorized Spindle* on all makes of 6" x 18" surface grinders. Its sealed-in motor may be 220 or 440 volt — 2 or 3 phase — 60 cycles, or 550 volt — 3 phase — 60 cycles.

It operates to equally good advantage horizontally, vertically or at any angle on boring mills, planers, milling machines and other machine tools for special work.

POPE SEALED MOTORIZED SURFACE GRINDER SPINDLE

Actually, unless we cut one open for you, the only thing you can see in this completely sealed unit is the results.

You can't see the G-E full 1 HP motor because it's sealed in — no openings for dust, dirt, nuts and bolts, unwary fingers — nothing to prevent its running at maximum efficiency indefinitely.

You can't see those SKF Super-Precision, Double Row roller bearings. They're sealed in, too, and with them the lubricant — no oiling or greasing to worry about or overlook.

And you can't see the massive inner construction and precision craftsmanship that give this Spindle the ability to produce finer finishes and to rough off surplus metal in jig time whenever required.

But you can see what it will do on your machines and for your ground surfaces. That's why we say *look into it*, now, for replacement of your present spindles, if you want to do better grinding and more of it at lower net cost.



POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION SPINDLES

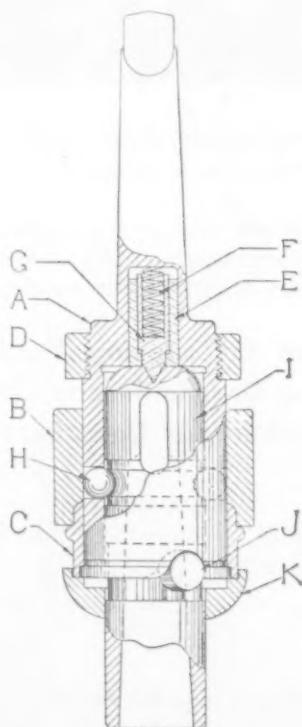
Jarvis POWER TOOLS

Quick Change Chucks and Collets

EXTRME accuracy, tremendous torque capacity and absolute safety are the outstanding features of the Jarvis Quick-Change Chucks and Collets.

In their manufacture exceptional care is taken in the selection of the steel for chuck as well as collet; both are hardened and ground inside and out.

Write for our
Latest Catalog MFTI



THE CHARLES L JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

Threading Precision begins here



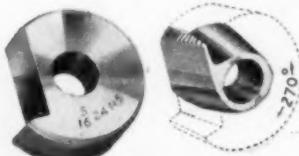
... and STAYS PUT



Namco Micrometer Gauge is also used for Multiple Circular Hollow Milling Cutters. These cutters are interchangeable with Circular Thread Chasers in the same Self-opening Diehead.

This Micrometer Grinding Gauge determines the proper amount of grind for Namco Circular Chasers, and then checks the accuracy of the Chasers after the grind.

Long runs of Class 3 threads start with precision—and precision is maintained throughout the run, because Chasers are reground on blocks that support them, and returned to head to cut identical threads without adjustments or variation.



Namco Self-opening Dies with Circular Ground Thread Chasers Cut Production Costs because

- ... Chasers may be ground through 270° circumference
- ... they maintain accuracy throughout the run
- ... reground Chasers may be replaced in two minutes, without disturbing the setup

- ... they eliminate "experimental" cuts—no spoiled work to increase costs
- ... grinding off as little as .008" per grind increases Chaser life 20 to 50 times

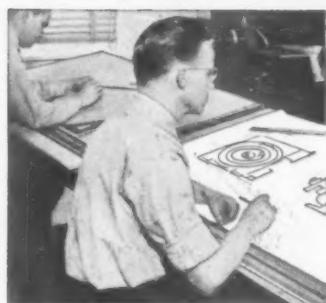
New Catalog D-42B gives you complete details.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

MAKE ALL OF THESE PRINTS FROM ANY DRAWING



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Black-line print
Blue-line print
Red-line print
Foil print
Dryphoto print
Black-line cloth
Sepia-line intermediate



Ozalid Type 2600—\$370 F.O.B.
Johnson City, N. Y.

With an Ozalid Dry-Developing Machine which you use with your present printer. First expose your drawing with the desired type of Ozalid paper. Then transfer the print to the OZALID DRY-DEVELOPER for quick processing.

With an Ozalid Whiteprint Machine which prints and dry-develops copies of your originals in seconds. No additional equipment necessary.



Ozalid Model F-8825 F.O.B.
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SAVE WITH THE ONLY COMPLETE PRINTMAKING PROCESS

When you adopt Ozalid, you have a versatility found in no other reproduction process—or combination of processes.

For only Ozalid offers you the advantages of Dry-development . . . with a complete line of sensitized materials that will inspire new applications in your plant, and promote savings on every side.

Here are just a few uses you'll find for the "OZALID VARIETY" which you can produce quickly in your machine—each print in the same manner.

● **Use Ozalid red, black, blue line** prints to identify prints of different departments . . . to distinguish checked from unchecked prints, etc.

● **Use Ozalid Rapid Black** (new black line paper) to obtain exceptional facsimiles of typewritten material. When the original is good, the print will be still better. **BESIDES OZALID PRINTS WON'T SMUDGE.**

● **Use Ozalid intermediate** prints in place of original drawings to produce subsequent prints...to supply branch offices . . . to save valuable time when making design changes.

● **Use Ozalid Dryphoto Paper** to make beautiful reproductions from photographic film-positives . . . or perspective drawings.

● **Use Ozalid cloth** when prints of exceptional strength are desired.

● **Use Ozalid transparent foils** to:
1. Produce extremely fast-printing intermediates
2. Make composite prints
3. Reclaim worn or damaged drawings

See all these prints yourself. ALSO learn the complete OZALID story. Write for free booklet of Ozalid Whiteprints and Catalogue today.



OZALID

Division of General Aniline and Film Corporation
Johnson City, New York

Ozalid in Canada—Hughes-Owens Co., Ltd., Montreal

Set-up men, assistant foremen, leadmen and workers say

**SMOOTH OPERATION
PLENTY OF POWER
LIGHT WEIGHT
HANDLING EASE**

make this new

Thor

RIVET SQUEEZER

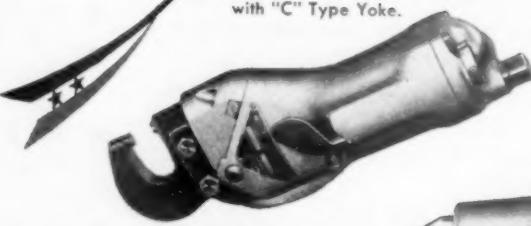
**the best liked tool
for the job**



The Thor PRS-10 Pneumatic Rivet Squeezer is the most powerful machine of its size on the market. Having a rated capacity for driving $\frac{1}{8}$ " aluminum, Dural or soft iron rivets, it can also be used for dimpling, pressing and similar operations. It is available in three styles—for "C" type yoke and with alligator jaws of $1\frac{1}{8}$ " or $2\frac{1}{2}$ " reach.

Its balance in conjunction with properly located throttle lever, and its finely graduated control, enable the operator to properly align the plunger or anvils over the rivet before applying the final squeezing stroke.

The design is streamlined; completely enclosed; air-actuated power and return strokes eliminating springs; full roller bearing construction. No strains are transmitted to the aluminum casing, which serves only as a locating medium and housing for the power transmitting mechanism.



Rivet Squeezer
with "C" Type Yoke.



Rivet Squeezer
with Alligator Jaws
of $1\frac{1}{8}$ " reach.

Rivet Squeezer
with Alligator Jaws
of $2\frac{1}{2}$ " reach.

Thor

Portable Pneumatic and Electric Tools

INDEPENDENT PNEUMATIC TOOL COMPANY



600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.

Branches in Principal Cities

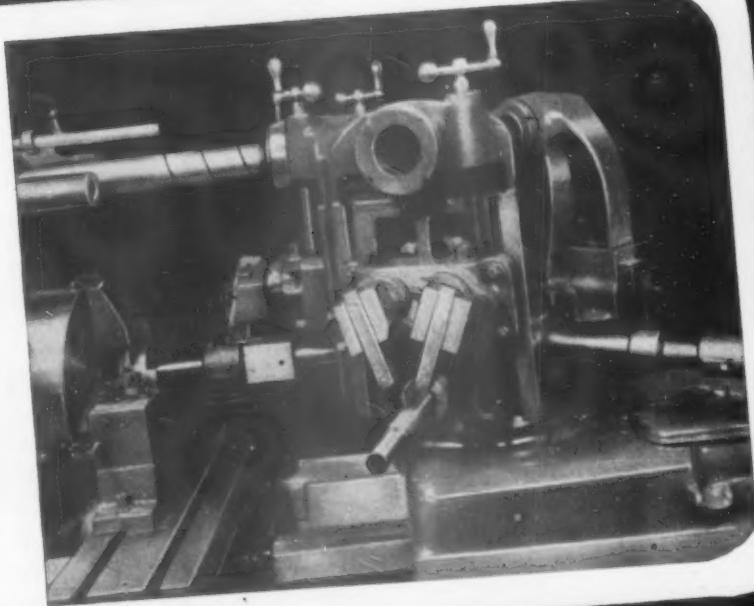
For complete technical data and prices
write today for Bulletin No. P-1232.

PRESENT P&J MACHINES

have set-up possibilities...for future needs because they can be RE-TOOLED to advantage.....

PRODUCING BEARING CAGES YESTERDAY

At the time this set up on a 5D Single Spindle Powerflex was being used in production, machining operations were being performed which resulted in a production of 18 bearing cages per 51 minute hour. Operations included rough and finish boring, facing, turning also chamfering, reaming and turning to size.

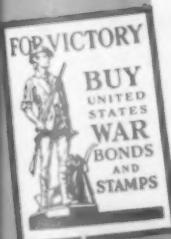


BUT...different parts tomorrow

To change over from pre-war parts to post-war products is merely a matter of converting present P&J machines to new use by RE-TOOLING. Past production performance on one job can easily be equalled or bettered on entirely new work, machines remaining essentially the same.

Your P&J Chucking equipment has already demonstrated its time-and cost-cutting advantages. Now you can project the utility of these machines into the future and derive still further returns from your original investment. At a fraction of the cost of a new machine, you can RE-TOOL existing P&J equipment for post-war production needs. Let our engineers study your problems and offer suggestions for handling it. We have the "know-how" and the complete facilities for rendering a valuable RE-TOOLING SERVICE. Investigate.

POTTER & JOHNSTON
MACHINE CO., Pawtucket, R. I.

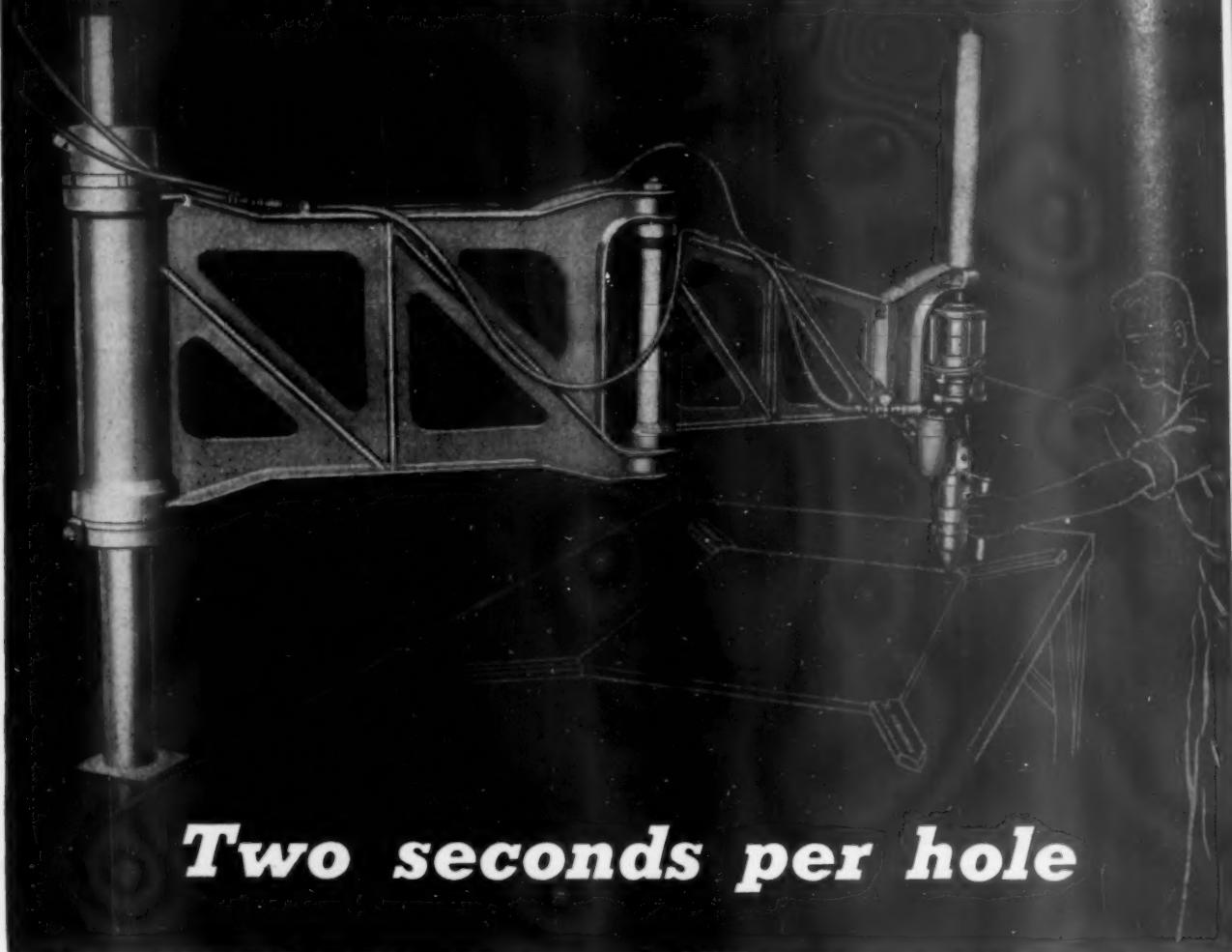


For the sake of VICTORY and PEACE BUY BONDS!

P&J Rebuilding Service

P&J is prepared and equipped to rebuild owners' present P&J Automatics to original productivity and accuracy. Re-tooling can also be handled while equipment is in our shop for rebuilding.

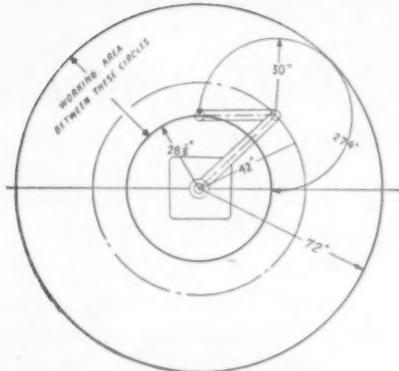
CP RADIAL DRILL



Two seconds per hole

TIME studies show that with a CP Radial Drill an operator can drill Dural sheets stacked to $\frac{5}{8}$ " thickness in an overall time of two seconds — including locating and drilling.

Developed primarily for stack drilling, CP Hicycle Radial Drill is equally proficient for other types of bench drilling. Available with either 60" or 72" reach. Two types of mountings: No. 10 Arm, equipped with hole spotter, for continuous production drilling up to $5/16$ " at 10,800 r.p.m. — a speed made practical by compressed air-fed oil to keep the drill bit cool and sharp; No. 11 Arm, for drilling up to $\frac{3}{4}$ ".



Operating Range of Nos. 10 and 11 Jack-Knife Arms

★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
HYDRAULIC TOOLS
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY

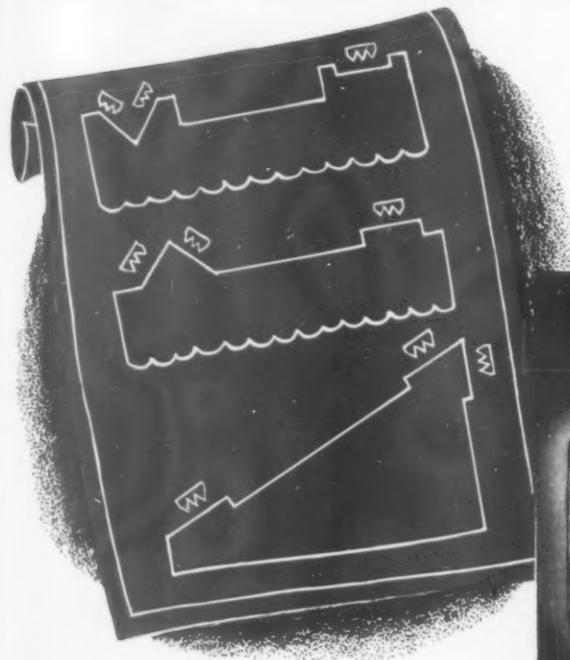
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★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

GRINDING

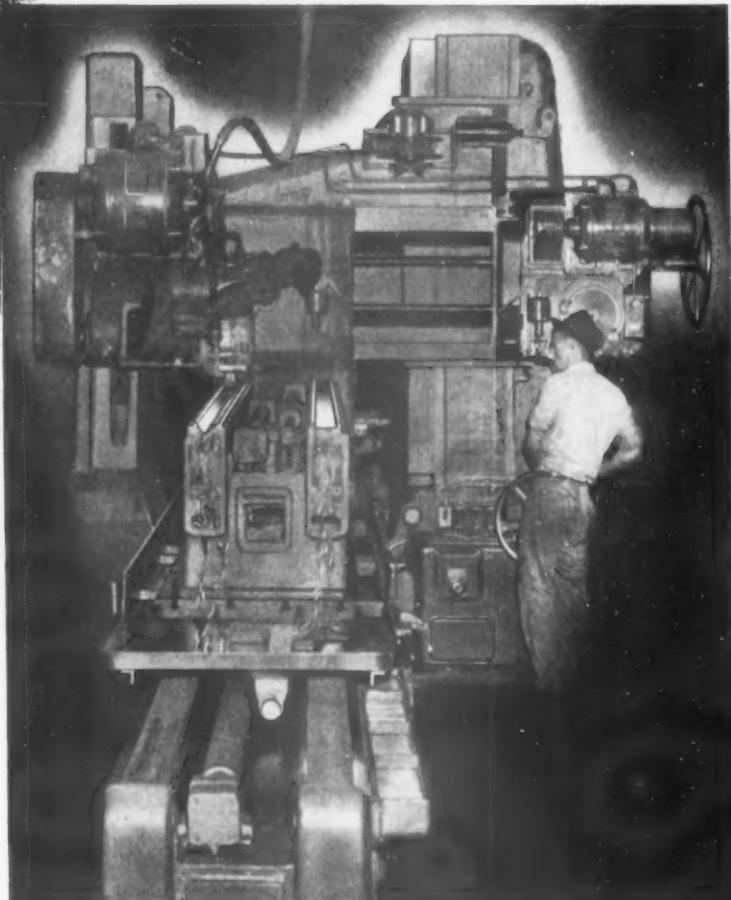
VEES, ANGLES, FLAT WAYS AND SURFACES

- Steps-up Production ...
- Assures Precision Finishing



Production costs go down and output increases greatly, when these surfaces are finished by *grinding*. The Hanchett Plano Grinder replaces conventional methods of machining and hand scraping, with important advances in precision and accuracy. And on hardened ways and surfaces, grinding is the *only* way to meet the extremely narrow limits set up for precision finishing.

Hanchett Plano Grinders are available with either horizontal or vertical spindles. The horizontal spindle type with straight wheel (illustrated) is particularly designed for the grinding of V-ways, angles and flat ways — on lathe beds, slides, columns, carriages, tables and similar parts — all of which must be precise for their entire length. Table sizes: 30" and 50" wide, and 72" to 220" long. Send for complete details today, in bulletin 170 T-13.



Example: Large base, weighing 4450 lb., 149" long; one flat way 2 $\frac{3}{4}$ " wide, and one Vee-way, 1 $\frac{1}{4}$ " x 1 $\frac{1}{4}$ ".



IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

SEVERANCE

CHATTERLESS COUNTERSINKS

GIVE MIRROR FINISH...

If your production calls for perfectly finished seats, you simply can't beat Severance Chatterless Countersinks. In a few seconds, they produce a finish that will stand up to a commercial ground job. Using a standard type, a finish sufficiently smooth for valve seatings may be obtained. Because of their staggered tooth design, they take clean, shearing cuts — thereby eliminating chatter. Available with any angle and in a wide variety of diameters, lengths and shanks. Heavy duty types have tang shanks and may be used with a Glenzer sleeve. Write today for complete facts about how Severance Chatterless Countersinks can solve your countersinking problem.

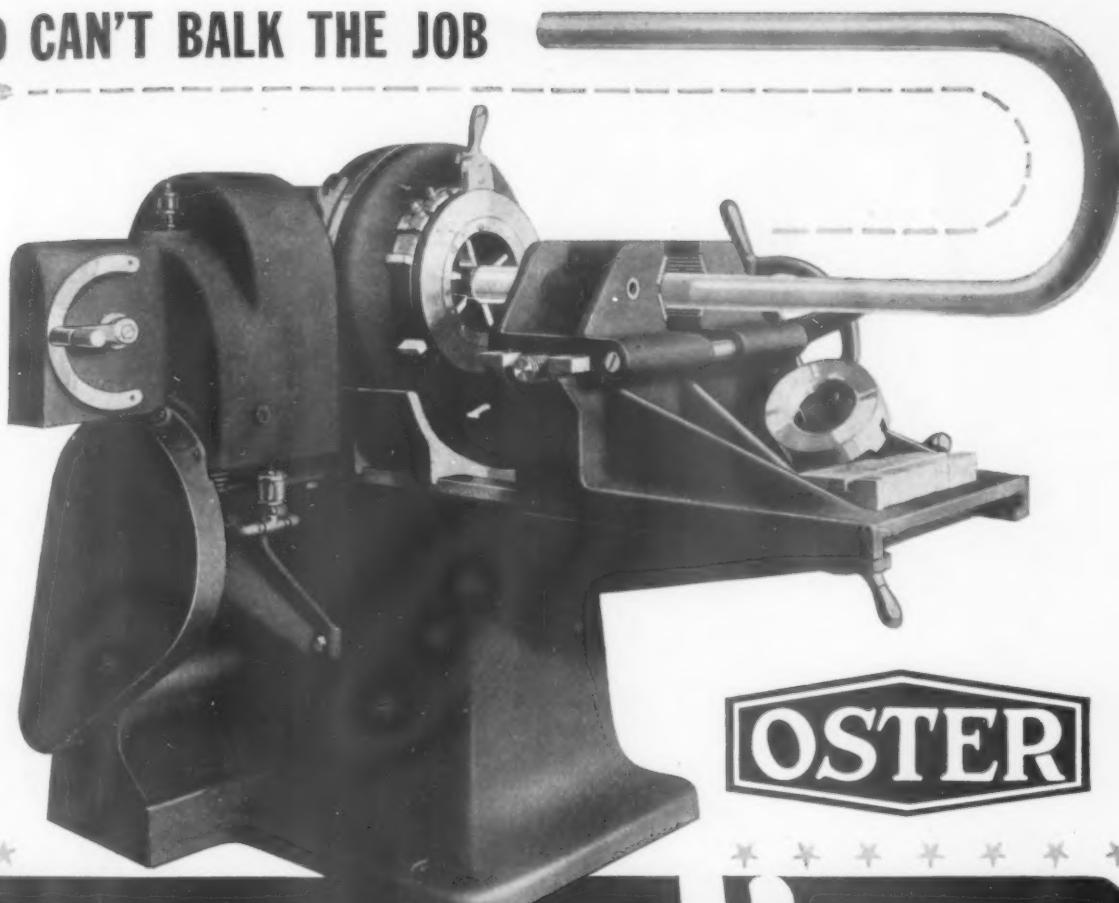


Severance Midget Milling Cutters and special cutting tools of many types are available, with Severance tooth design, for finishing every kind of wood, plastic, metal and alloy. These fast-working tools take sharp bites, throw off clean chips. For best service, order new cutters and send your worn cutters for regrinding to the nearest Severance plant.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN • PLANTS IN LONG ISLAND CITY 1, NEW YORK; DETROIT 2, MICHIGAN; FORT WAYNE, INDIANA; CHICAGO 6, ILLINOIS; AND LOS ANGELES 21, CALIFORNIA. IN CANADA: 60 FRONT STREET WEST, TORONTO, ONTARIO.

A BEND CAN'T BALK THE JOB



OSTER

No. 300 line

GENERAL PURPOSE THREADING MACHINES

Note the open type vise and revolving die-head which makes bent pipe as easy to thread as straight pipe on the Oster No. 300 Series machines.

No complicated, costly changes of equipment are needed to thread a wide variety of work including long, short, straight, bent pipe, nipples, rods, studs, and bolts.

Lever-operated die-head gives full control of threading-dies. Quick and easy adjustment of chasers for shallow or deep threads is another advantage of the No. 300 Series Die-Head.

Built-in cut-off guides are adjustable for all

sizes of pipe within range of each machine. A lathe-type cut-off tool ground with proper cutting angle and clearance cuts pipe off clean and square, leaving no burr. Cut-off tool is fed and oiled automatically and is easily removed for re-sharpening when required.

Three Sizes of "No. 300 Series" Machines

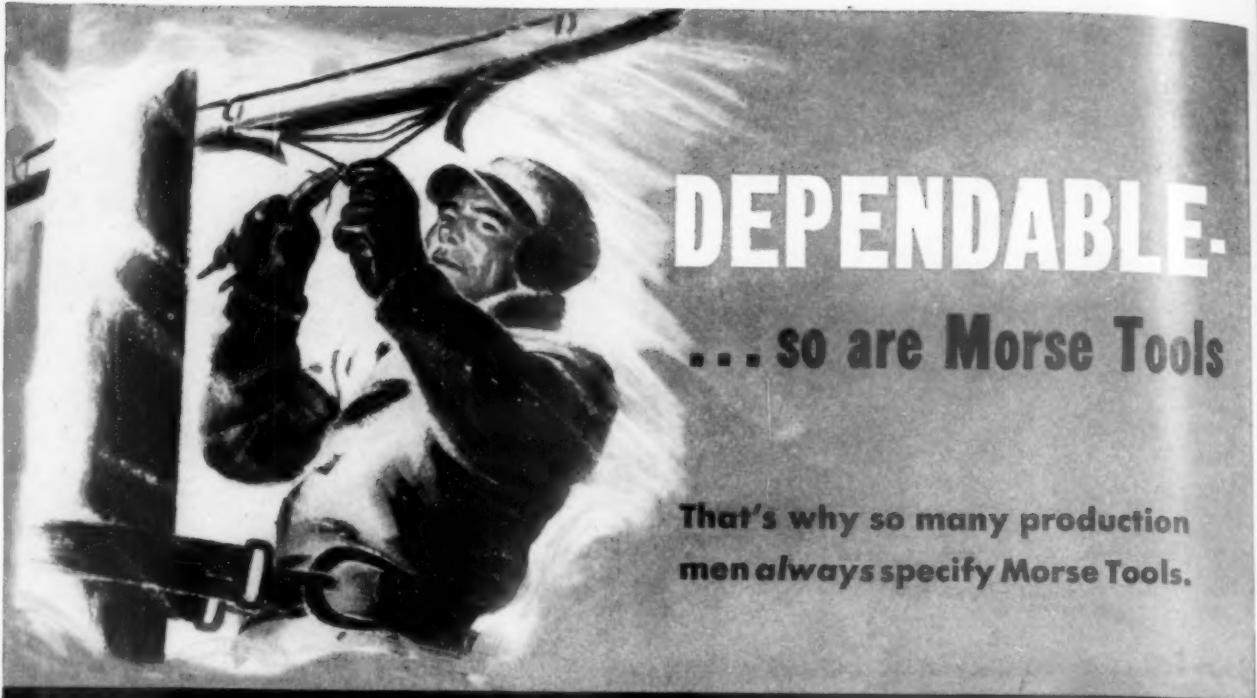
No. 302: Standard pipe range: $\frac{1}{4}$ " to 2". Extra pipe range: $\frac{1}{8}$ ". Standard bolt range: $\frac{1}{16}$ " to $1\frac{1}{2}$ ". Extra bolt range: $\frac{3}{16}$ " to $\frac{1}{2}$ ".

No. 304: Standard pipe range: 1" to 4". Extra pipe range: $\frac{1}{2}$ " and $\frac{3}{4}$ ". Standard bolt range: $1\frac{1}{8}$ " to 2". Extra bolt range: $\frac{3}{4}$ " to 1".

No. 326: Standard pipe range: $1\frac{1}{4}$ " to 6". Extra pipe range: 1". Standard bolt range: $1\frac{3}{4}$ " to 4". Extra bolt range: 1" to $1\frac{1}{8}$ ".

Write for illustrated catalog "LIST NO. 12-A"

THE OSTER MANUFACTURING COMPANY • 2063 EAST 61ST STREET, CLEVELAND 3, OHIO, U. S. A.



DEPENDABLE.

... so are Morse Tools

That's why so many production
men always specify Morse Tools.



TOOLS ARE WEAPONS . . . TREAT 'EM RIGHT!

MORSE

THERE IS A
DIFFERENCE

**TWIST DRILL AND
MACHINE COMPANY**
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. ---- CHICAGO STORE: 570 WEST RANDOLPH ST.
SAN FRANCISCO STORE: 1180 FOLSOM ST.



It is reported that

A recent survey shows that 89% of the tire and rubber companies and 86% of the paper companies will have new products to offer after the war. 58% of all manufacturers questioned have something entirely new for post-war customers.

get ready with CONE for tomorrow

A new heat-treated glass is in production that resists thermal shock and temperatures to 650° F.

get ready with CONE for tomorrow

One of the large tire manufacturers has just patented a tubeless, uninflated automobile tire.

get ready with CONE for tomorrow

Bimetallic cylinders for internal combustion engines, in which a copper sleeve is bonded to a cast iron cylinder, promise to lessen greatly the problem of heat transfer that has always interfered with high performance.

get ready with CONE for tomorrow

Indium, once worth \$20,000 an ounce, now costs \$7.50.

get ready with CONE for tomorrow

A plant has just been opened to rebuild completely automobiles by the production line method to new car standards.

get ready with CONE for tomorrow

Aircraft engineers imagine that the big airlines of the future will dispense with landing gear entirely and will be electronically guided into a wheeled cradle at each landing field.

get ready with CONE for tomorrow

The same type of mechanism now used to stabilize the guns of moving tanks could be used to provide smoother riding trains.

get ready with CONE for tomorrow

Foam rubber is expected to replace familiar upholstery construction in automobile seats, saving nearly a foot in the length of the body.

get ready with CONE for tomorrow

One big national picture magazine plans to print entirely in full color after the war.

Through careful research and improvement, one familiar office machine has had 94 per cent of its noise eliminated or absorbed.

get ready with CONE for tomorrow

Electrically conductive rubber is being used to heat aircraft guns and propellers.

get ready with CONE for tomorrow

By the use of a resin extracted from Southern pine, foundries have been able to reclaim old sand and reduce their consumption of new sand as much as 75 per cent.

get ready with CONE for tomorrow

A new filtering material, made of pure rubber latex, has as many as 6,400 holes to the square inch.

get ready with CONE for tomorrow

A new adhesive bonds wood to metal, making possible a new product consisting of a 1/48" ply of wood combined with a thin layer of sheet steel. This material can be readily cut and bent, and is decorative, durable, and fireproof.

The advertisement features a large, dark, cylindrical object, possibly a component of a machine, positioned vertically on the right side. Below it is a smaller, rectangular machine with various mechanical parts and a wheel, labeled "CONOMATIC". The background is dark with faint, stylized text and graphics, including the word "CONE" in large letters. The overall theme is industrial and futuristic.

Read how

Tool Hardening

...When machining 4820 steel forging, form tool became dull after running 150 pieces...tool was subjected to Deepfreeze process and then cut 510 pieces...foreman said: "You sure have run into something. Why don't you treat all our tools in a Deepfreeze?"

...Corrugating tools for cutting grooves in chilled rolls were increased from 63-64 to 68-69 Rockwell C hardness by treatment in a Deepfreeze...this is "tops" for that job.

Metal Stabilizing

...In all cases we have found that by using the proper heat treatment and Deepfreeze process...in stabilizing our gauge blocks and large lapping flats...we have been able to promote all of the growth and thereby prevent any further distortion.

Shrink-fit Assembly

...Our Deepfreeze machine is saving us between \$3,000 and \$4,000 per month over the cost of liquid air for chilling a bushing assembled in a Diesel engine piston...another type of chilling unit did not provide sufficient shrink for proper assembly.

Low-Temperature Testing

...Deepfreeze machine used for testing aircraft components, both production items and experimental models...much time and expense saved in eliminating difficulties which otherwise would not show up until the item had been in use on the airplane at high altitude.

Other Applications

...Improving magnetic properties of steel magnets,...storage of aluminum rivets and parts...repair of broken milling cutters...freezing of rubber and rubber-like plastics for machining...salvaging of worn gauges by promoting growth...and many others.

NAMES FURNISHED ON REQUEST

Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE
Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Industrial Users*

Have Profitably Applied

Deepfreeze

Sub-Zero Chilling Machines

...in applications like these

The process of sub-zero cooling in a Deepfreeze Cascade -120° F. Chilling Machine is being profitably used in diversified industrial applications to obtain new high standards not possible under previous methods.

No more convincing proof can be offered than the results obtained in actual, practical applications. A few typical statements contained in letters from industrial users are reproduced at the left...many more reporting equal success have been received from manufacturers, jobbing shops, heat treating plants and other business firms.

Deepfreeze Industrial Chilling Machines are used most widely in the fields of tool hardening, metal stabilizing, shrink-fit assembly and low-temperature testing. They are also employed for storage of aluminum rivets and parts, freezing rubber for machining, removing pitch from optical lenses, salvaging worn gauges, and many other applications where the ability to attain sub-zero temperatures quickly can be used to advantage.



Removes 1000 B.T.U.'s per hour at -120° F.

The Deepfreeze Cascade -120° F. Industrial Chilling Machine has the capacity for high production metal chilling. This unit will remove 1000 B.T.U.'s per hour at -120° F. when work is immersed in convection fluid. Primary freezing surfaces of over 31 sq. ft. are provided. A full 4" of Santocel insulation and the efficiency of the "Cascade" system of heat removal result in minimum operating costs.

Investigate Cold Treating

Learn how you can profitably apply Deepfreeze sub-zero temperatures in your own plant—easily, economically, and with uniform success. Get performance data on many actual applications. Write for "Cold Treating Practice"—a FREE 40-page illustrated booklet that gives recommended procedures and all of the latest authentic information. Ask for Bulletin No. 1-4.



Deepfreeze Used by Topflight Manufacturers

Deepfreeze sub-zero chilling machines are being used profitably every day in the nation's leading industrial plants, large and small. Partial list of users in this booklet (see page 38).

2311 DAVIS STREET
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Michigan

REXALLOY

STANDARD TOOL BITS • STANDARD TIPPED TOOLS • SPECIAL TOOLS-TIPPED AND SOLID • CASTINGS



More and better work with fewer grinds
REXALLOY . . . Crucible's Cast Cutting Alloy
for "Middle-Range" Machining Applications

REXALLOY, Crucible's cast cutting alloy, completely covers that productive and cost-cutting range between the upper limits of high speed steel and the lower limits of tungsten carbide. Its high red-hardness and resistance to shock and abrasive wear often permit 25% to 100% increased speed, feed or depth of cut. In addition to greatly stepped-up production, REXALLOY almost invariably improves the quality of the finished product. Of equal importance in urgent war work is the fact that down time is materially reduced because this "Middle-Range" cast cutting alloy has such an exceptionally long cutting life between grinds.

A REXALLOY Service Engineer will gladly demonstrate in your own plant how completely REXALLOY covers the entire "Middle-Range" of your machining applications on all types of steel, iron, copper, brass, bronze, aluminum and similar metals. REXALLOY is available in standard tool bits, standard tipped tools, special tools, both tipped and solid, and castings. Mail the coupon today.

Buy More War Bonds

CRUCIBLE STEEL COMPANY

Chrysler Building, 405 Lexington Avenue, New York 17, N. Y.
Branches, Warehouses and Distributors in Principal Cities

Crucible Steel Co. of America
405 Lexington Ave., N. Y. 17, N. Y.

- Please mail me your new book, "REXALLOY CUTTING TOOLS".
- We would like to discuss the possible use of REXALLOY in our plant.

Name _____

Firm _____

Address _____



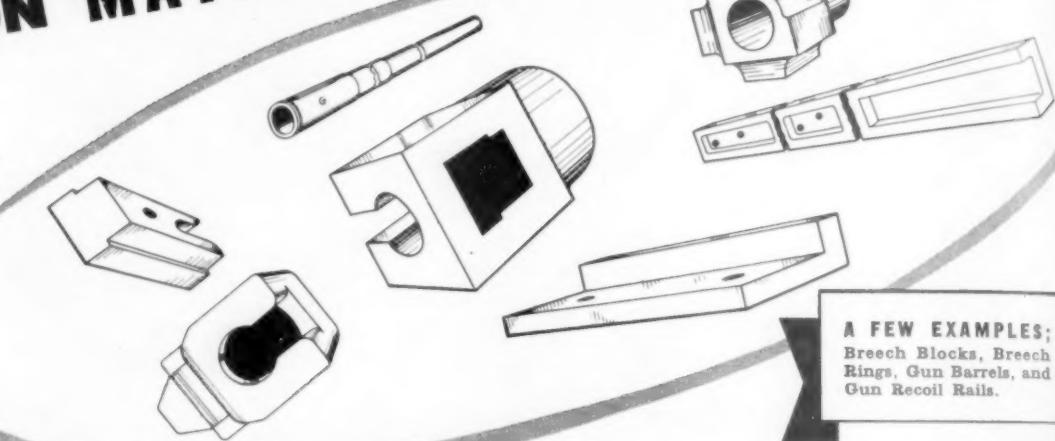
City _____

of America

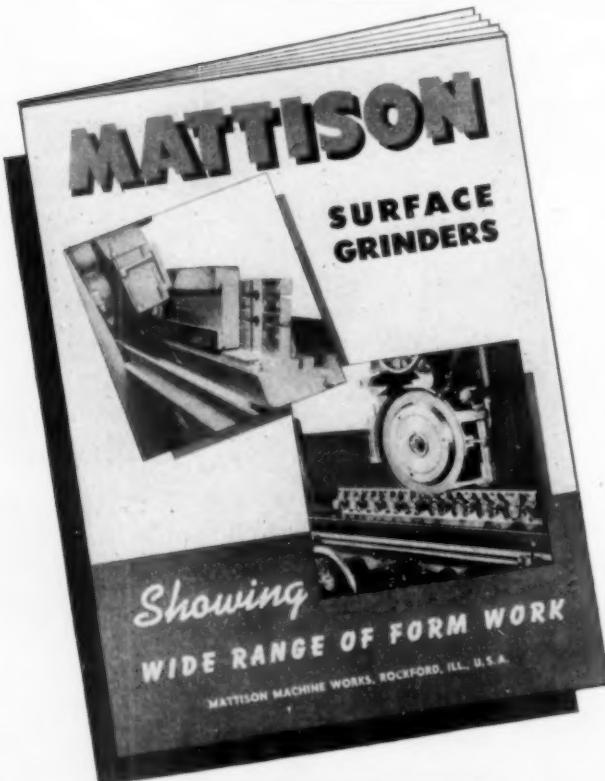
HIGH SPEED • TOOL • STAINLESS • ALLOY
MACHINERY • SPECIAL PURPOSE STEELS

WIDE RANGE

OF FORM WORK NOW BEING GROUND
ON MATTISON SURFACE GRINDERS



A FEW EXAMPLES;
Breech Blocks, Breech
Rings, Gun Barrels, and
Gun Recoil Rails.



Through the use of special fixtures and contour dressing devices the above parts are all being ground on the Mattison High-Powered Precision Surface Grinder with a great saving of time and to extremely close limits of accuracy. These applications are important, not only from the standpoint of present production needs, but because they illustrate the unlimited capacity of Mattison Grinders over and above regular flat grinding. To you it opens up a new opportunity for grinding, a new opportunity for saving and a new opportunity for increasing production on work previously thought impossible to grind.

Ask for new free book, showing these and other unusual jobs ground by means of special fixtures and dressing devices on the Mattison Grinder.

Send for this NEW BOOK

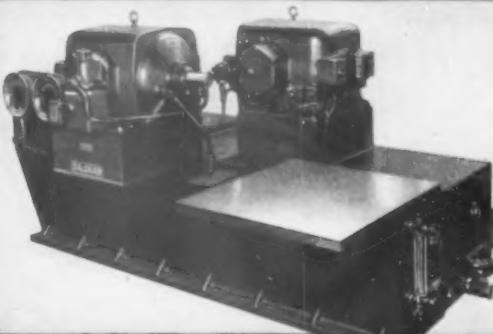
MATTISON

MACHINE WORKS

ROCKFORD • ILLINOIS



Economical Oilgear Radial Rolling Piston power units are used to charge stationary and portable catapult power plants to catapult planes at flying speeds in something over 100 feet. Besides high linear speed obtainable over a wide range, acceleration and/or deceleration are controlled, power can be stored during idle period.



FROM ZERO TO
FLYING SPEED IN A
MATTER OF SECONDS

ARE YOU TRYING TO:

1. Apply large forces through long... or short... strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction... with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light... or heavy... forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full preset automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

JUST ANOTHER EXAMPLE OF
OILGEAR'S AMAZING ABILITY TO SOLVE THE
PROBLEMS OF UNIQUE POWER TRANSMISSION

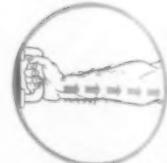
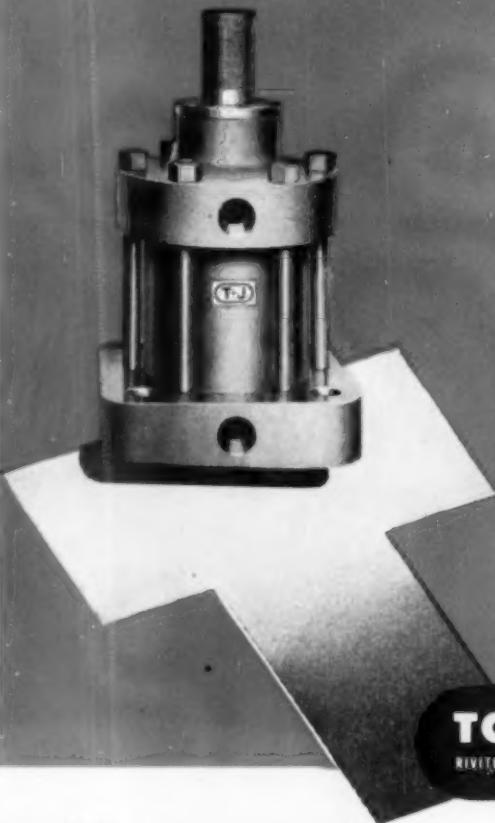
There is hardly any limit to the applicability of Oilgear Fluid Power. In catapulting heavy airplanes from the decks of carrier escorts, Oilgear not only furnishes the tremendous power required to accelerate the load from zero to flying speed in a few seconds but it accumulates this power with comparatively small, standard units while each plane is being maneuvered into position. You can use units of this type on other installations where tremendous power or high velocity is required intermittently, as in die casting machines, braiding and knitting machines, riveting presses, etc. Or if your machine power or transmission requirements lie far afield, they are almost certain to be met... better, more economically... in any of the scores of other functions Oilgear Fluid Power provides. Just as war industry built upon peacetime knowledge, so today shrewd designers are adopting the lessons learned in war. Put your problem up to Oilgear engineers; see if their solution isn't what you've been looking for. Do it now... THE OILGEAR COMPANY, 1308 West Bruce Street, Milwaukee 4, Wisconsin.

OILGEAR
Fluid Power

MOVE "MOUNTAINS or MOLE HILLS"

IN ANY DIRECTION

Here's efficient power movement to help you get maximum speed in your production...use T-J Air and Hydraulic Cylinders! Apply a T-J Cylinder to eliminate muscular effort or to simplify mechanical movements—the ideal way to clamp, press, raise or shift in any direction! Built in many styles, sizes and strokes to meet your requirements...exerting power movement of 100 lbs. to 12,000 lbs. (direct) with T-J Air Cylinders...1000 lbs. to 50,000 lbs. (direct) with T-J Hydraulic Cylinders. Easily and quickly installed. Write for latest catalogs.



FOR TOUGH JOBS SPECIFY

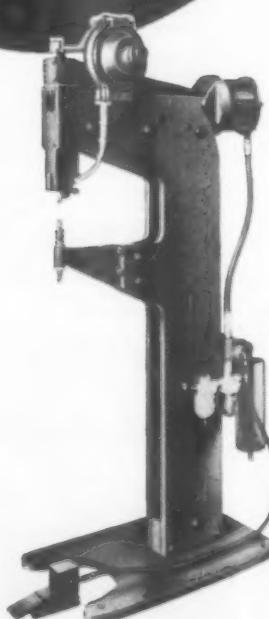
TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS



"Rev'up"
**AIRCRAFT RIVETING
THE RIVITOR WAY**

● T-J Air Powered RIVITOR brings speedy automatic feed riveting to aircraft production! Designed to handle exclusively aircraft (aluminum alloy) riveting...Production on the Rivitor depends on the individual application and requires no manual rivet handling. Operates with Air Squeeze action...cost-cutting efficiency. Soundly engineered, sturdily built. On today's tough production lines, *T-J gets the O.K.!* Write for bulletin. The Tomkins-Johnson Co., Jackson, Michigan.



RACINE

Oil Hydraulic

PUMPS and PRESSURE BOOSTERS

The Variable Volume principle incorporated in the design of Racine Pumps reduces horsepower requirements and provides a great flexibility of operation. These pumping units are of the multiple radial vane type, producing a smooth, quiet delivery at all operating pressures.

Volume ranges from zero to the full capacity of the pump. Changes are accomplished by regulating the relative position of the pressure chamber ring to the rotor. These changes are available under automatic, manual or hydraulic control. High efficiency is inherent in the simple design of Racine Pumps and is safeguarded by skilled workmanship and the maintenance of exacting tolerances on all parts.

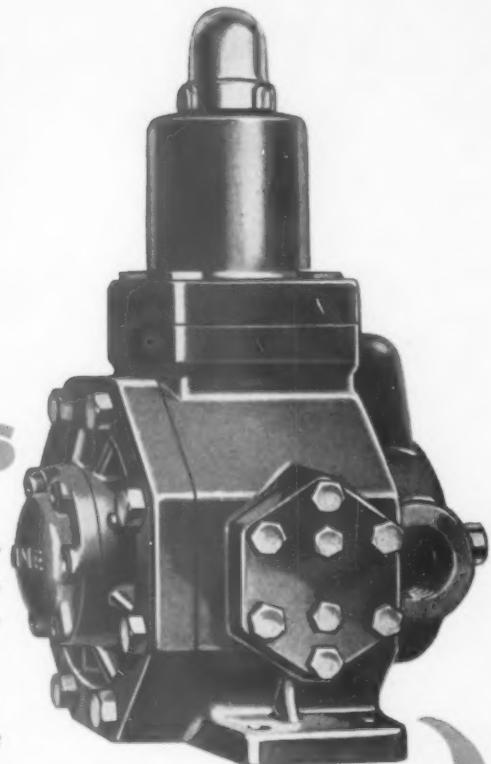
Racine Hydraulic Pumps, Valves, Controls and Pressure Boosters have been used for many years in a wide variety of applications. Manufacturers of machine tools, presses, molding machines, lifts, stokers and a large group of other products, have standardized on Racine equipment.

Consult our Engineering Department. Out of their long and varied experience valuable information is available to you without cost or obligation. Write today for a copy of Catalog P-10-C which illustrates the full Racine Line. Address Dept. TE-P.

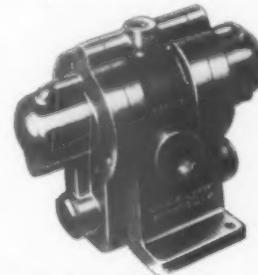


RACINE HYDRAULIC METAL CUTTING MACHINES

For almost 40 years Racine has built constantly improved high speed Metal Cutting Machines. All capacities from 6" x 6" to 20" x 20" are available. See



Racine Variable Volume Pumps — Capacities 12-20-30 G.P.M. Operating Pressures 50 to 1000 lbs. P.S.I. Furnished for either clockwise or counter-clock rotation.



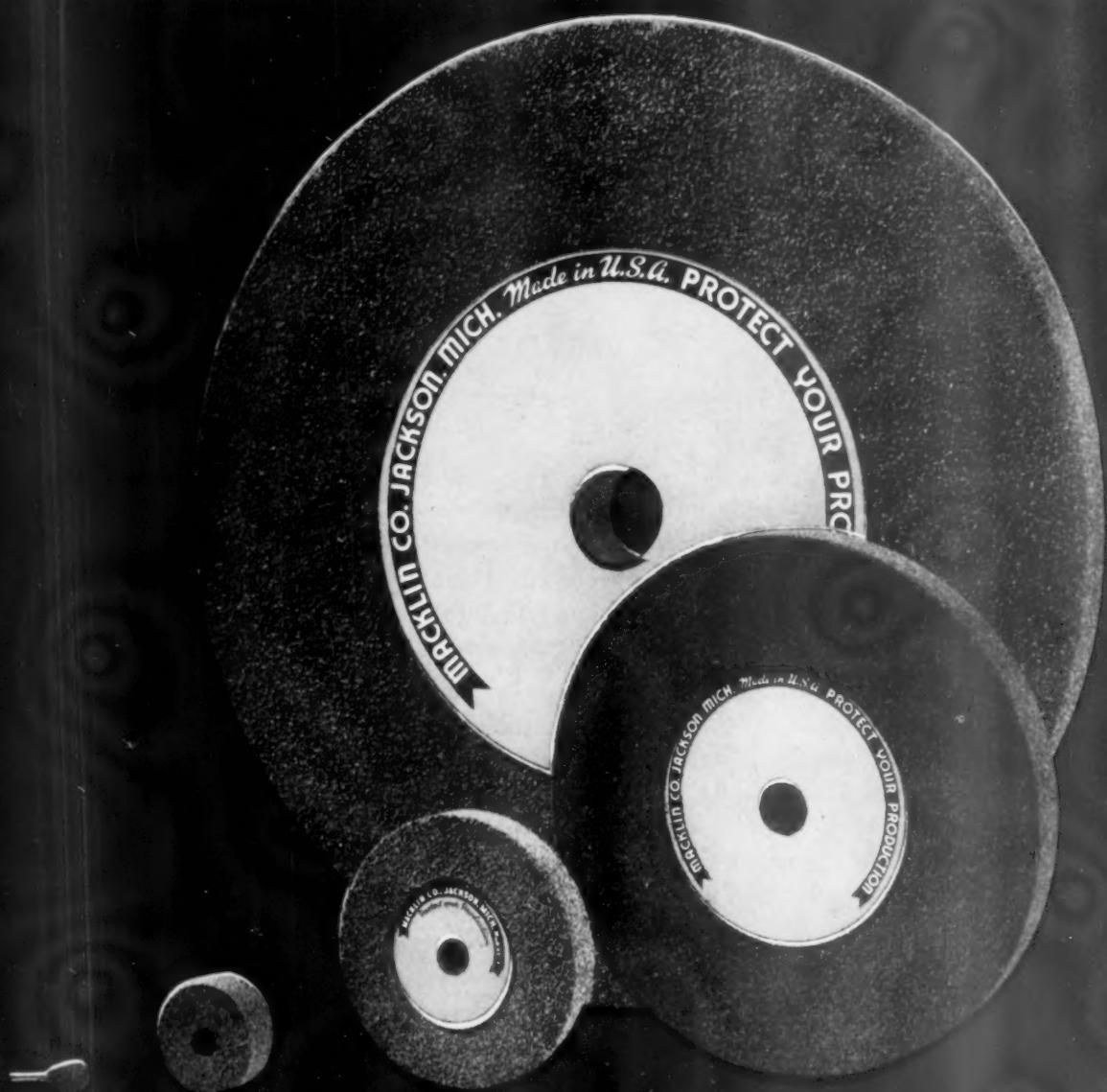
Racine Pressure Booster — Compact, self-contained, requires no special foundation. Available in several ratios. Converts low pressure oil to high pressure in ratios as high as 7 to 1. A simple, hydraulically actuated pumping device adaptable to any circuit. Equally effective with constant and variable volume pumps. 10 $\frac{1}{8}$ " high, 8 $\frac{1}{8}$ " wide, 18" long.



RACINE

TOOL and MACHINE
COMPANY

Standard for Quality and Precision
RACINE, WISCONSIN, U. S. A.



MACKLIN GRINDING WHEELS.

"**PROTECT YOUR PRODUCTION**" with Macklin High Quality Wheels—made from the smallest to the largest—in all grains and grades, for every grinding purpose.

Ask for the services of a Macklin field engineer

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U.S.A.

Distributors in all principal cities

Sales Offices: — Chicago — New York — Detroit — Pittsburgh — Cleveland — Cincinnati — Milwaukee — Philadelphia



A 35-SECOND RECIPE FOR CLUTCH PLATES

Any housewife, just enlisted in war work, can understand this!

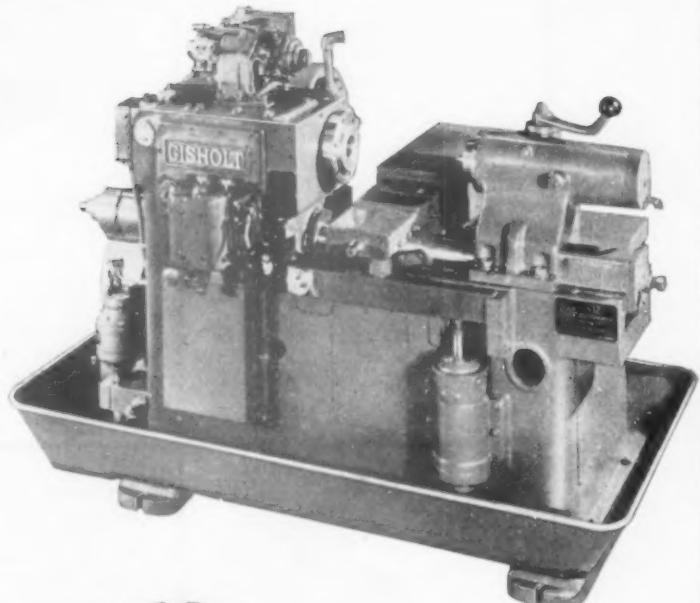
Take the rough casting for an 8" clutch pressure plate and place in the chuck of a Gisholt Hydraulic Automatic Lathe. Start machine and let run at 400 r.p.m. with .005" feed for 35 seconds or until machine automatically stops. Remove finished plate which is ready to serve on a jeep.

It's as simple as that with the Gisholt Hydraulic Automatic Lathe. And it's typical of the way many inexperienced workers are producing a wide variety of parts quickly and accurately to meet the demands of war production.

Gisholt engineers are ready to help you apply the speed and simplicity of the No. 12 Hydraulic Automatic Lathes to your own specific problems in large volume machining. Write for complete information.

GISHOLT MACHINE COMPANY
1229 E. Washington Ave. • Madison 3, Wisconsin

*Look Ahead—Keep Ahead—With
Gisholt Improvements in Metal Turning*



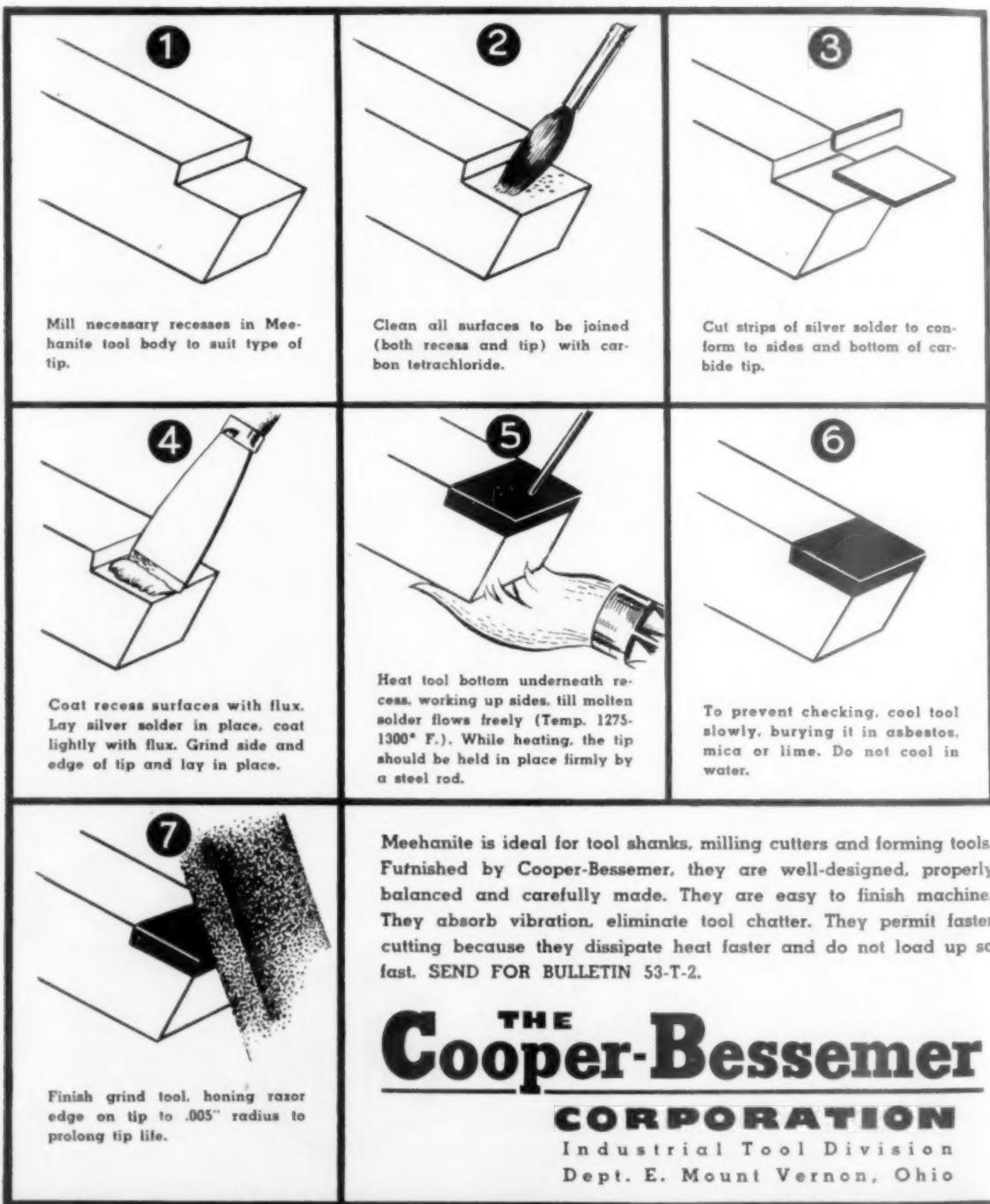
THE GISHOLT HYDRAULIC AUTOMATIC LATHE is adaptable to a wide variety of between-centers and chucking work. It provides high speed multiple cutting with extreme accuracy. One operator usually tends two or three machines.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

Tips on Tipping

COOPER-BESSEMER MEEHANITE TOOL BODIES

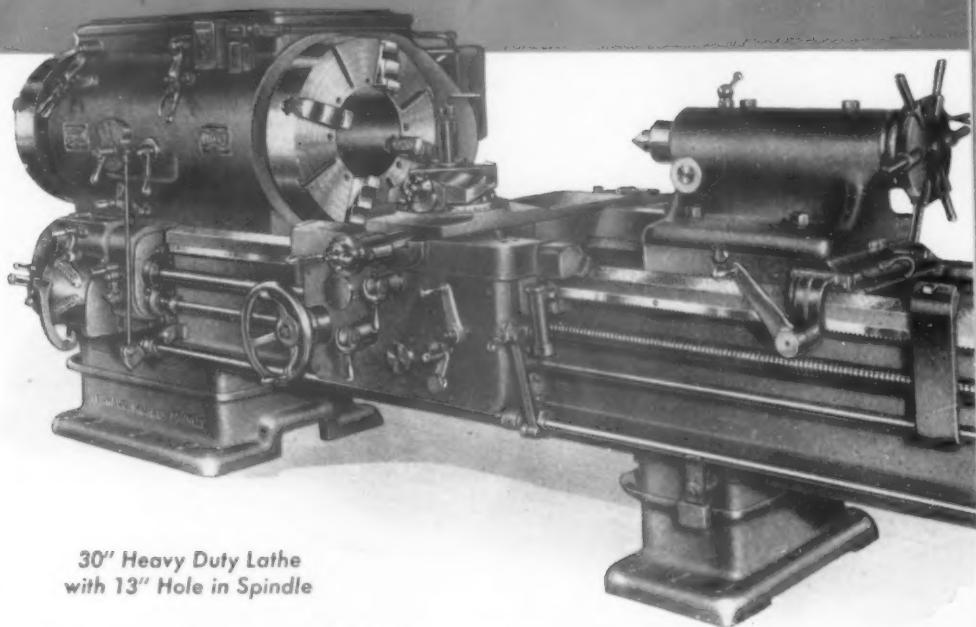
In hundreds of busy war plants, machine shops are saving money and critical tool steel by brazing carbide cutting tips on Cooper-Bessemer Meehanite Tool Bodies. If you are not doing it, the sketches below will show you how simple the operation is:



**THE
Cooper-Bessemer
CORPORATION**
Industrial Tool Division
Dept. E. Mount Vernon, Ohio

Do You Run A Temperature
Over Certain Machining Jobs?

Solve Your
Problems
with a



30" Heavy Duty Lathe
with 13" Hole in Spindle

HYDRATROL LATHE

Large Hollow Spindle Type

For Faster
Production -
Better Work -
Lower Costs!



Shop after shop is finding that it can do many machining jobs better with a Large Hollow Spindle Type of HYDRATROL LATHE. In these shops, the results of installing a HYDRATROL are invariably faster production, better work, lower costs.

Maybe YOU can "do it better" on a HYDRATROL LATHE. Why not send us prints of your difficult, unusual or too-costly jobs, for a specific, time-and-money-saving recommendation.



18" Lathe with 7 1/8" Hole in Spindle

FIVE SIZES - 18" TO 36"

Small . . . 18" up to 7 1/4" Hole
Medium . . . 24" up to 12" Hole
Large . . . 27" up to 13" Hole
Large . . . 30" up to 14" Hole
Large . . . 36" up to 16 1/2" Hole
(Standard type lathes, 16" to 36")

Lehmann MACHINE COMPANY

ROUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI

Inside Story

OF A PRECISION HYDRAULIC CYLINDER



This cylinder is 6 x 10 inches, with cushion on head end.

Every Hannifin hydraulic cylinder has these features of improved design and precision construction that promise easier and simpler application, long life without maintenance, and maximum utilization of hydraulic power.

No tie rods. This construction is simpler and stronger, and allows removal of an end cap without collapse of other parts.

Universal end caps. Either end cap can be positioned independently, for convenience in mounting and for simple piping.

Air Vents. Each end cap has air vent plugs on three sides.

Bored and honed bodies. All Hannifin cylinder bodies are bored and honed to exact size. This not only means a cylinder interior that is straight, round, and smooth; but one in which piston assemblies are interchangeable. If a replacement piston is ever needed it can be furnished, and will fit perfectly.

Minimum Fluid Slip. Remarkably low fluid leakage past the piston is assured by exact bores and close tolerances on the piston, plus the use of precision rings.

Maximum power. Precision cylinder bodies and piston ring seal provide for consistent high efficiency operation with maximum usable power.

All types and sizes. Seven standard mounting types are available in a full range of sizes 1 to 6 inch bore, for working pressures up to 1500 lbs. sq. in. Models are available with or without adjustable cushions, and with small diameter piston rod, 2 to 1 differential piston rod, or double end rod.

Many special mountings and large size cylinders are also available, built to order. Write for bulletin 35 giving complete specifications.

HANNIFIN MANUFACTURING CO.
621-631 South Kolmar Avenue • Chicago 24, Illinois

Hannifin
HYDRAULIC CYLINDERS

PRODUCTION PERSPECTIVES

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

WAR PRODUCTION: Washington expects 1944 output to come within 2 per cent of the scheduled volume of \$67,300,000,000. This will be a gain of 14 per cent over last year's \$57,000,000,000 output....September war production came nearer schedule as a result of cutbacks and pressure on "critical" heavy mobile equipment programs....Monthly output, last reported at \$5,450,000,000, must hit a pace of better than \$5,600,000,000 to meet schedules.

OUTLOOK: War Department talk on European war is pessimistic. Pentagon brass hats are putting the heat on WPB, warning against overoptimism and too much reconversion talk....New civilian goods production valued at \$152,441,000 is under way in 772 plants under the "spot authorization" plan. Fewer than 50 persons are employed in 71 per cent of the shops resuming normal output.

V-E DAY: Defeat of Germany will release 4,000,000 workers from their war jobs....WPB's announced intention to revoke 350 existing controls and simplify the remaining 150 when Germany folds would virtually end control over metal products and durable goods manufacture....Despite WPB Boss Krug's confident reconversion talk, his agency is split over a plan for resumption of peacetime output. One school plumps for industry "quotas"; the other favors removal of all controls, allowing manufacturers to fight it out for men and materials.

MACHINE TOOLS: Big news is the sharp rise in new business, reported as 25 per cent in August and high again in September. Bulk of the new orders were for the heavy ammunition program....Manpower is the most serious industry problem, with builders struggling to maintain output....WPB is warning builders to fill \$120,000,000 in Russian commitments by next June 30.

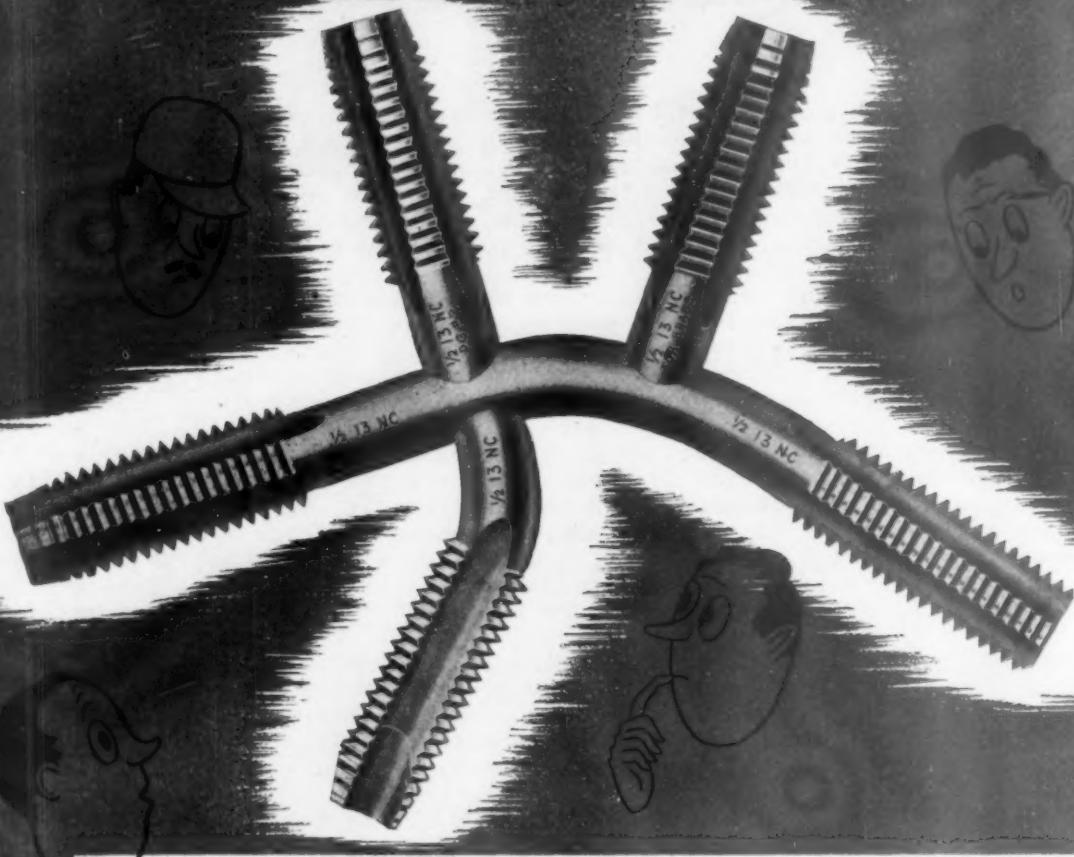
RECONVERSION ORDERS: WPB has approved \$46,000,000 in unrated "reconversion" machine tool orders. Builders have reported acceptance of only \$7,000,000, indicating that \$39,000,000 in orders are kicking around industry offices. Ninety per cent of the orders - 6,000 to 7,000 machines - are from the auto industry....General Motors postwar machine tool orders have reached a total of approximately \$31,000,000.

POSTWAR TRANSITION: Many builders say that elimination of WPB ratings on all orders except military and a "few foreign" will not materially speed delivery of critical "reconversion" machines....Few builders will show postwar designs until after V-E Day. Few actually have designs ready....Startling news is the builder's plan to help sell Government-owned surplus machines.

SURPLUSES: Government-owned war-built machine tools earmarked as surplus are officially estimated to total 500,000 units....U.S. industry was using only 1,000,000 machine tools in 1935....Complicating the problem is the British threat to return nearly \$200,000,000 worth of Lend Lease machines....Surplus machines that flattened the market after the last war numbered only 80,000.

DETROIT: Ford has finally disclosed its postwar blueprint, revealed plans calling for the expenditure of \$150,000,000 on plant expansion, machine tools and equipment. Two new branch plants will be built, one in St. Louis. Ford's promised low price model - 20 per cent below regular prices - has the competition worried....Chevrolet moved nearer readiness for auto production with the purchase of 789 DPC machine tools. Price: \$2,379,000, about 61 per cent of original cost....War-rejuvenated Graham-Paige is readying a "futuristic" postwar car, a new line of farm implements.

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Grinding Compound Angles on Forming Tools

Easy to use formulas developed from long toolroom experience, save hours of cut-and-try, and assure holding cutting angles through continual regrinding. They can be applied to determine unknowns wherever similar compound angles may occur

CHARLES L. HALL

DODGE DIVISION
CHRYSLER CORPORATION

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Author grinding forming tool according to formulas for compound angles.

THE PROPER GRINDING of compound angles on various types of forming cutters, so that tools may be repeatedly face sharpened without changing the angle or form of the work, presents a problem of unusual complication—if cut-and-try methods are applied. Actually, through the use of simple formulas, the job of setting up and grinding compound angles on the types of tools covered by the formulas is not more difficult than that encountered in almost any tool grinding operation.

The development of this method is the result of many years experience in the toolroom. Its value and practicality is proven in its daily application in several shops where the method has gained recognition.

There is no restriction in the manner in which the formulas are set up which limits their usefulness. Wherever compound angles must be ground which have the proportions of those covered by the formulas, the formulas are applicable. In addition to the presentation of the formulas for the several common cases illustrated in this article, a practical example is presented, showing the application with given dimensions.

From time to time, formulas for accurate determination of compound angles for common types of forming tools will be published. Readers are invited to request formulas on problems which cause them the most difficulty.

Tilted Vee Clearance Angle--Side Angles Equal

IN ADDITION to referring to the clearance angle on a forming tool, the formula for the tilted Vee with equal side angles may be used in producing the corrected angles of a tapered spline gage, a beveled gear, or a fixture for drilling an angular hole.

The formula for determining the correct included angle to permit maintaining a specified cutting angle in regrinding the face of the tool is expressed as:

$$\cot \frac{a}{2} \times \cos b = \cot c$$

Where, referring to Figure 1:

a = included perpendicular angle,

b = clearance angle,

c = corrected angle to dress on both sides of grinding wheel.

Applying the formula to Figure 1, the problem is to determine the angle to dress the grinding wheel, so that it will cut a 60° Vee on cutting surface A , and so that angle a will remain 60° following regrinding of face.

One-half the included perpendicular angle a equals 30° , and its cotangent is 1.732; the tilted clearance angle b equals 17° , and its cosine is .9563.

$$1.732 \times .9563 = 1.6563$$

$1.6563 = \cot$ of $31^\circ 7' 15''$ which is the corrected angle to dress the grinding wheel for each side. In grinding, clamp the tool or fixture on an angle plate set up at 17° , and grind both sides of Vee together.

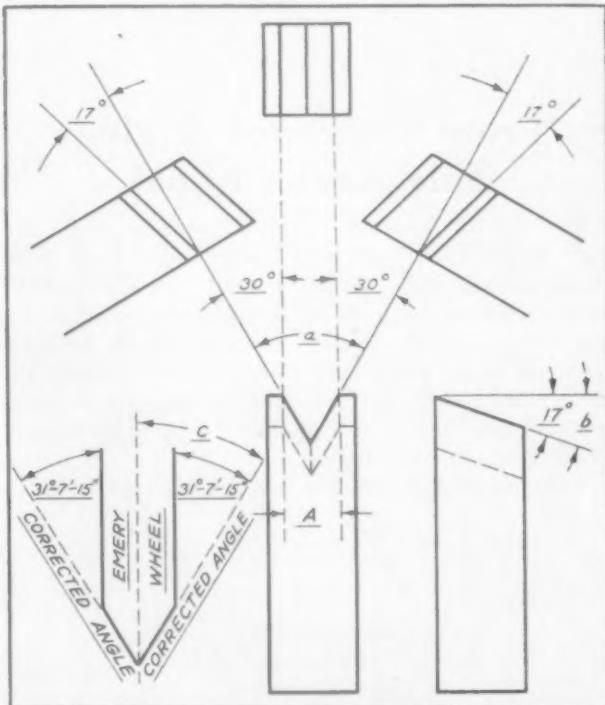


FIGURE 1.
Tilted Vee clearance angle—side angles equal.

Grinding 90° Vee

WHEN ANY AMOUNT is ground off one side of a 90° Vee, as in Figure 2a, the roll C drops in direction A, and moves over in direction B. Below are formulas for determining movement of roll C toward A and B, where D is equal to the amount ground off.

Where one side of the Vee is ground:

$$A = D \times .7071$$

$$B = D \times .7071$$

Where both sides of a Vee are ground equally:

$$A = D \times 1.414$$

Referring to Figure 2b, where a grinding wheel is dressed to 45°, the distance roll C moves down in direction A and over in direction B equals one-half the distance grinding wheel advances in direction A.

Grinding Any Vee

IN FIGURE 3, which represents any Vee angle, one-half the amount ground off one side is multiplied by the cosec of one-half the included angle, shown as a , to determine the distance roll C will travel in direction A. Where D equals the amount ground off, this is expressed as:

$$A = \frac{D}{2} \times \operatorname{cosec} \frac{a}{2}$$

The distance the roll C will travel in direction B, where D equals the amount ground off, is expressed as:

$$B = \frac{D}{2} \times \operatorname{secant} \frac{a}{2}$$

Referring to Figure 4, where a grinding wheel is dressed to one-half the included angle a , and advanced in direction A, the formula below determines distance roll C will travel in direction of A and B. D equals the amount the grinding wheel advances in direction A.

$$A = \frac{D}{2} \quad B = \frac{D}{2} \times \tan \frac{a}{2}$$

Front Clearance Angle-- Side Angles Equal

ONE OF THE COMMONEST types of forming tools employing compound angles is that which has a front clearance angle, with side angles equal. Determining the proper front clearance, so that regrinding the face of the tool will not change the form, is easily done by applying a formula whereby the tangent of the tip up clearance angle is multiplied by the cosecant of one-half the included front clearance angle. The product is equal to the tangent of the front clearance angle.

Referring to Figure 5, the formula can be expressed:

$$\tan a \times \operatorname{cosec} \frac{b}{2} = \tan c$$

Where:

a = tip up clearance angle

b = included perpendicular angle

c = front clearance angle

Applying the formula to the dimensions in Figure 5:

Tan of 8° tip up clearance = .14054

Cosec of $\frac{1}{2}$ included perp. angle (30°) = 2.000

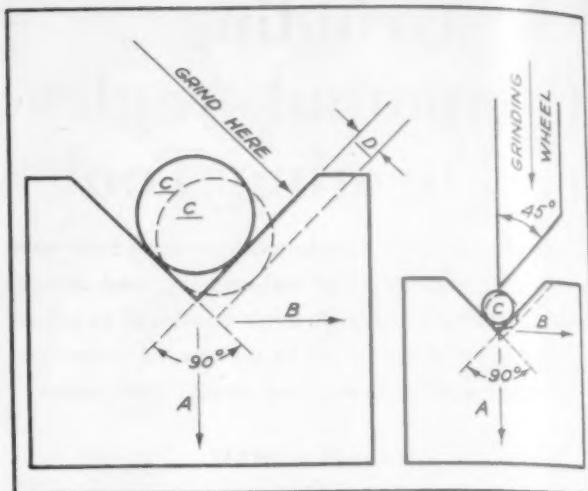


FIGURE 2a, at left. FIGURE 2b, at right.
Grinding 90° Vee.

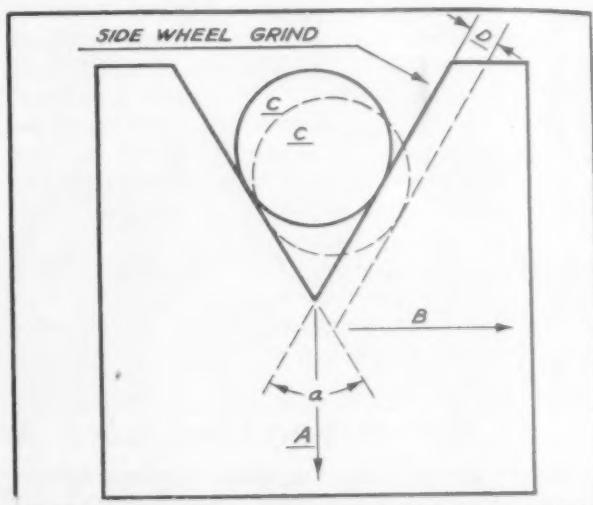


FIGURE 3. Grinding any Vee

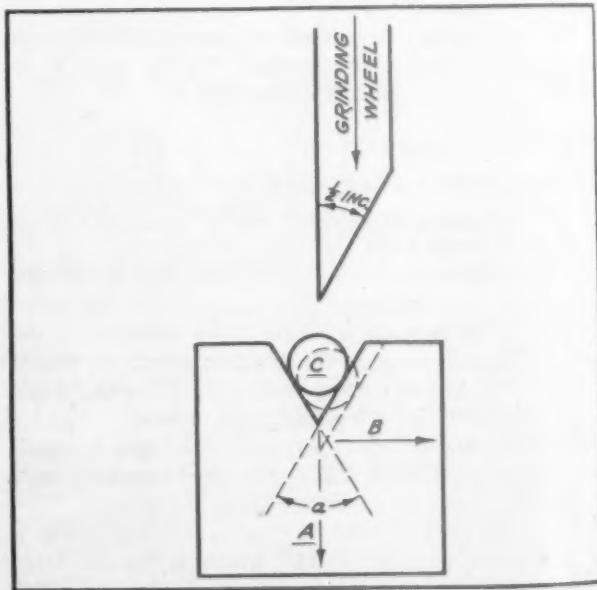


FIGURE 4.
Grinding any Vee, with relation to grinding wheel.

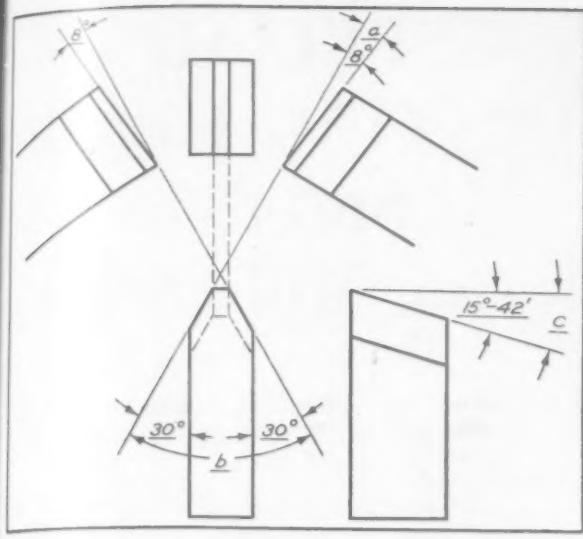


FIGURE 5.
Front clearance angle, side angles equal.

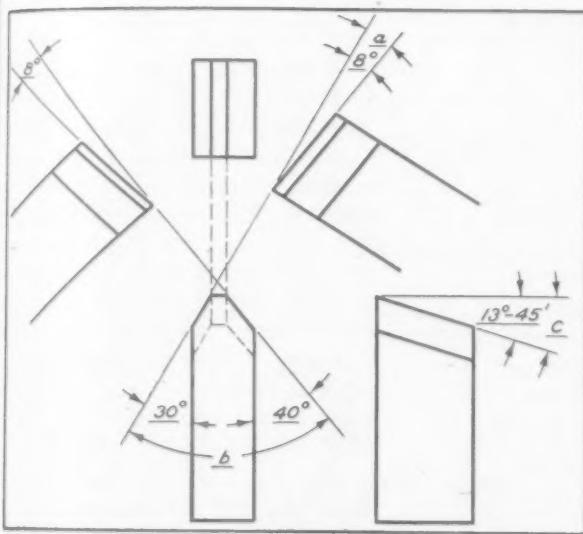


FIGURE 6.
Front clearance angle, side angles different.

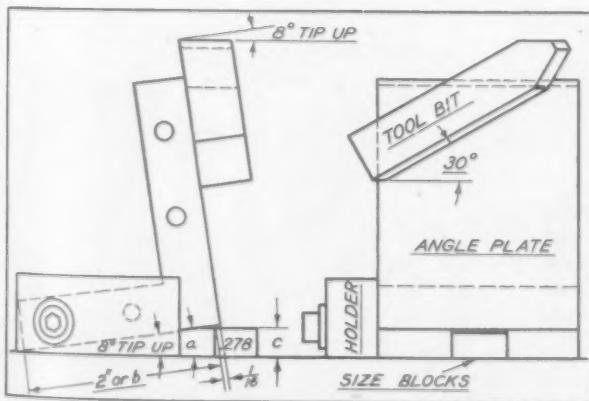


FIGURE 7.
Schematic drawing to illustrate application of formula for grinding specified tip up angle on tool shown in Figure 5. Though sine fixture is recommended, size blocks or rolls can be applied by use of formula.

.14054 x 2.000 = .28108
.28108 = tangent of 15° 42', which is the correct front clearance angle for this tool.

Front Clearance Angle-- Side Angles Different

TO DETERMINE the front clearance angle of a tool where the side angles are different, the same formula is applied as where side angles are equal. However, an additional step is required in calculation, that of adding the unequal angles to obtain the included perpendicular angle which is divided by two.

Referring to Figure 6, the formula is expressed:

$$\tan a \times \operatorname{cosec} \frac{b}{2} = \tan c$$

Using the dimensions in Figure 6:

Tan 8° tip up clearance angle = .14054

½ of 30° + 40° (included perp. angles) = 35°

Cosec of 35° = 1.743

.14054 x 1.743 = .24496

.24496 = tangent of 13° 45', which is the correct front clearance angle for this tool.

Tip Up Clearance

TIUP UP CLEARANCE, which is referred to in the problems to which Figures 5 and 6 pertain, is a common factor in the design of forming tools. It is the clearance angle which must be ground on the side angle of a tool to clear the work.

To examine the method for grinding the 8° tip up clearance angle, the tool shown in Figure 5 serves where side angles are equal, each being 30°.

The first step, as in grinding any of the forming tools shown here, is to be sure that the sides of the tool are square. The tool is then clamped on an angle plate at 30°, and the angle plate is clamped to a sine fixture which is set up at 8°. This does not alter the 30° angle.

If a sine plate is not available, it is a simple matter to set the angle plate up by the use of size blocks or rolls. For simple illustration of the formula, Figure 7 is a schematic drawing of how the problem may be solved. In this instance, the size blocks are unknowns, though rolls of known dimension might be used, in which case b would be unknown. However, using size blocks, with relation to a given position beneath the base of the angle plate, their dimension can be determined by multiplying the sine of 8° by the length of the angle plate base which is used in lieu of a sine fixture. Referring to Figure 7:

$$\sin a \times b = c$$

Or:

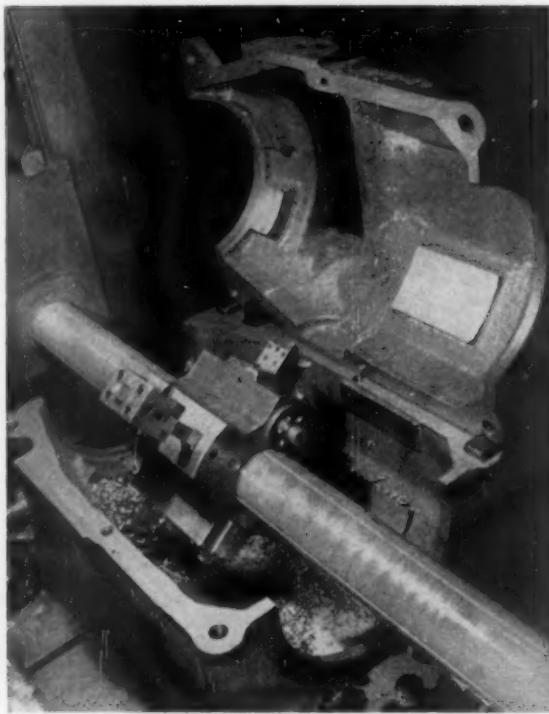
$$\sin 8^\circ = .13917$$

$$.13917 \times 2 = .278$$

.278 = height of size blocks which are inserted 1/16" from the end of the angle plate base, so as to tip up the angle plate 8°.

In this case, 2" of the 2-1/16" base of the angle plate, was selected to serve in the improvised sine fixture, 1/16" being sufficient to hold the size blocks. If the angle plate has tapped holes in its sides, it is easy to obtain a square piece of stock with several holes in it to fasten the angle plate to the grinding chuck.

THE END



CARL EBERHARDT
SHOP TOOL DESIGN DEPARTMENT
THE WARNER & SWASEY COMPANY

IN REACHING the peak of war production, emphasis was on volume. The approach, was to set up entire production lines based on the sequence of operations involved in meeting given schedules.

That induced a somewhat rigid approach that has stood in the way of handling jobs of limited volume. Now such jobs have become attractive to many plants. They find that certain units of their production line could well be diverted to this type of work. But available jobs rarely appear suited for handling on equipment that can be most readily released.

The reaction has been that machine tools are somewhat lacking in flexibility; that they are, by design, too nearly "single purpose".

Subcontract war work in our plants provides several instances that would indicate that the flexibility needed is dependent on ingenuity in the design of special tools with which to adapt standard equipment for handling these temporary jobs.

A somewhat extreme case may serve to illustrate.

When we undertook a subcontract for machining watertight rotor housings for shipboard deck winches, it became necessary to handle a diffi-

SPECIAL CUTTING HEAD Speeds Boring Mill Output

Special cutting head is positioned on boring bar in relation to interior surfaces of cast steel rotor housing to be machined. Note position of star wheel and feed screw, which is actuated by knocker to extend radii of tools used for generating face flanges and recess.

cult part of the operational sequence on a No. 42 Lucas Boring Mill.

Specifications call for machining the sand cast steel housings to produce 16-1/2" diameter flange faces at each end, with concentric inside diameters of 13-1/2" bored to a depth of 3/4", and finished to within plus .002". The outer edge is chamfered 1/16".

Two additional inside diameters of 14-3/8" and 14-13/16" respectively, are bored within the forward end, to serve as brush holders. A recess 1-1/6" wide is cut between them.

Machining four stator pads inside the housing represents a sizeable job of intermittent cutting. These are

finished to a diameter of 19-13/16", within a tolerance of plus .003", minus .000".

A job of this order would present an extremely difficult cut-and-try condition, if undertaken with only standard boring bar equipment. The development of a special multiple cutting head has reduced it to a straight production job.

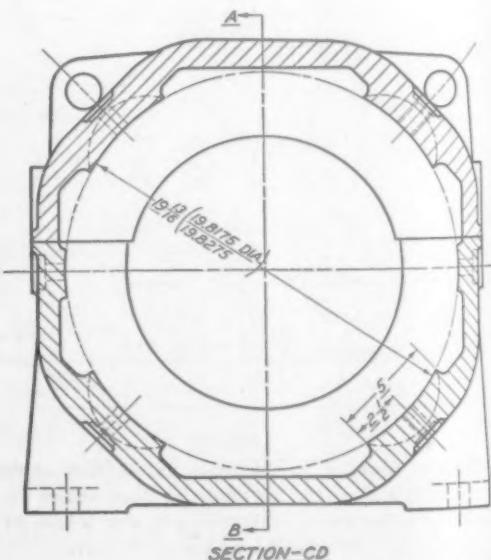
Several of the functions ordinarily performed by machine tools themselves are incorporated in the design of this head. Among them is the method of gaging the extent of both rough and finish cuts.

In plan form the head resembles the turret of a lathe, each of its four arms providing seating for adjustable cutting tools. Tools are preset, with dial indicator and a master transfer block, as shown in Figure 2 to describe the exact radius of the cut for which each is intended.

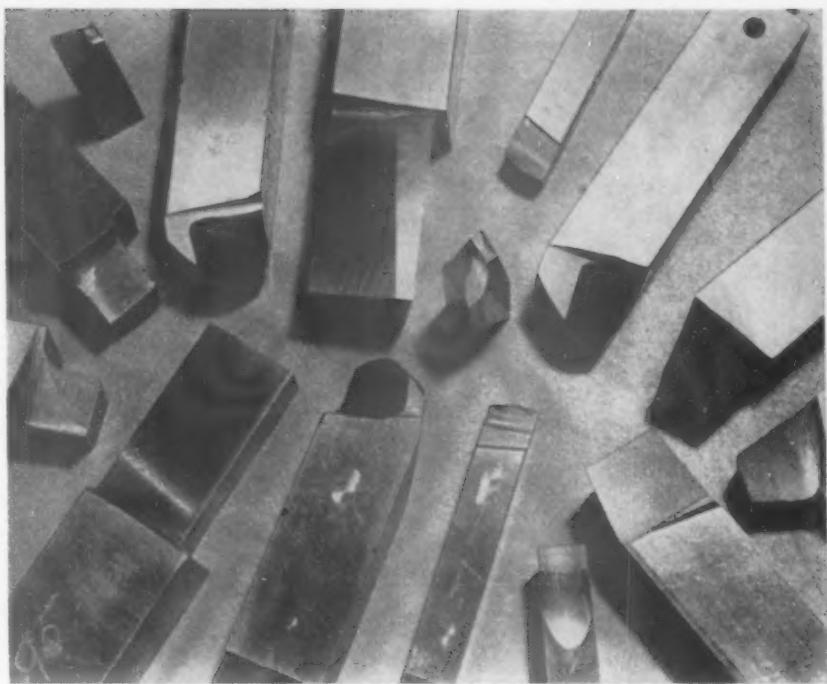
Built into one of the arms is a star wheel and feed screw which operates a cam lift. When actuated by a knocker, the device extends the radii of the three separate cutting tools

FIGURE 1.
Cast steel rotor housing showing flange faces and stator pads which are machined in one setup on the boring mill. Note close tolerances.

Warner & Swasey drawings and photos



Tooling flexibility accounts for speed and economy in the growing number of short run orders which typify this phase of war production. An example of how it is done is told in this article on streamlining a boring sequence



High-speed tools, used at conventional speeds and feeds, produce fine finishes required in housing.

mounted in this arm of the head. Two of the tools are used to generate the flange faces.

Facing the flanges, is a novel operation to undertake with the boring mill. A finish of the quality necessary to provide the water-tight feature of the 2" face, however, could not be held with a cutting edge of that breadth.

Two tools, mounted at 45° angles from each side of the special arm, generate the flange faces at each end of the cast steel housing by facing and back-facing operations. As mentioned, the tools are preset to position before mounting. Each contact with the knocker extends their radii at a feed rate of .015" per revolution.

Between these two tools and on the same special arm of the cutting head, a third tool is mounted perpendicular to the axis of this boring bar. It likewise is preset and, through actuation of the star feed, cuts the recess necessary to separating the two surfaces of different diameters within the forward end of the housing which serve as brush holders. Depth of the recess is accurately gauged by merely

counting the number of times the star feed contacts the knocker.

The other three arms of the cutting head receive the specially ground tools with which the remaining rough and finish operations are accomplished.

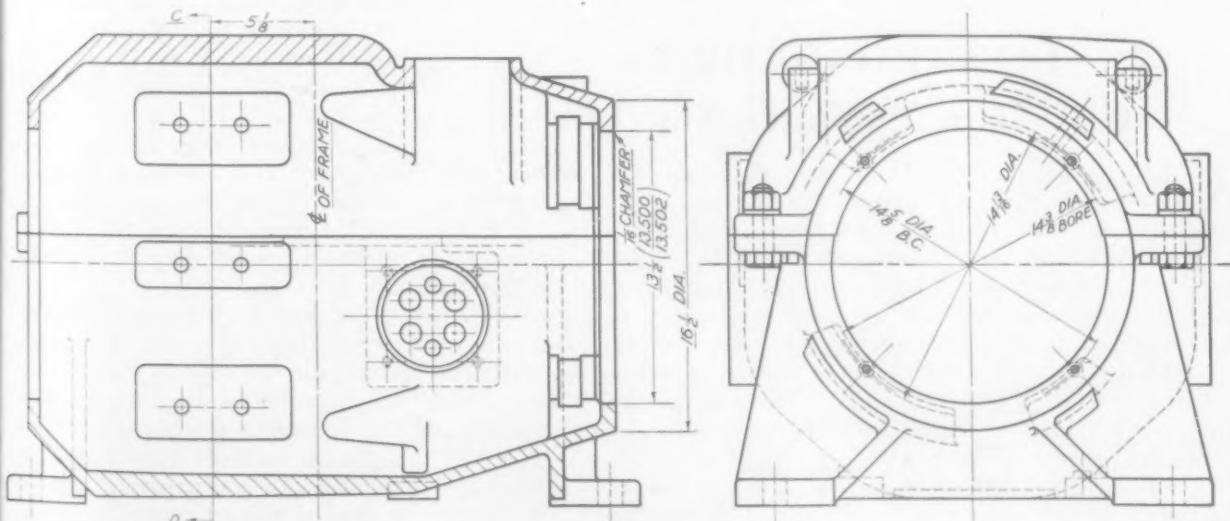
For the intermittent cut of 19-13/16" diameter required on the stator pads, a high-speed steel cutting tool with 45° helix and 10° top rake, is employed. The finish feed rate is .020" per revolution.

This application is in opposition to the currently growing practice of achieving a finish with such mediums

as cemented tungsten carbide edges at high speeds and low feed rates. The same result is obtained, however, the finish on these cast steel housings having proved completely satisfactory.

In each of the operations accomplished with this special head on the Lucas mill, the fact that a "built in" method is provided for gaging the work accounts for much of the time saved.

As compared with assigning this job to a sequence of conventional boring bar operations (and which would have been inadequate for the



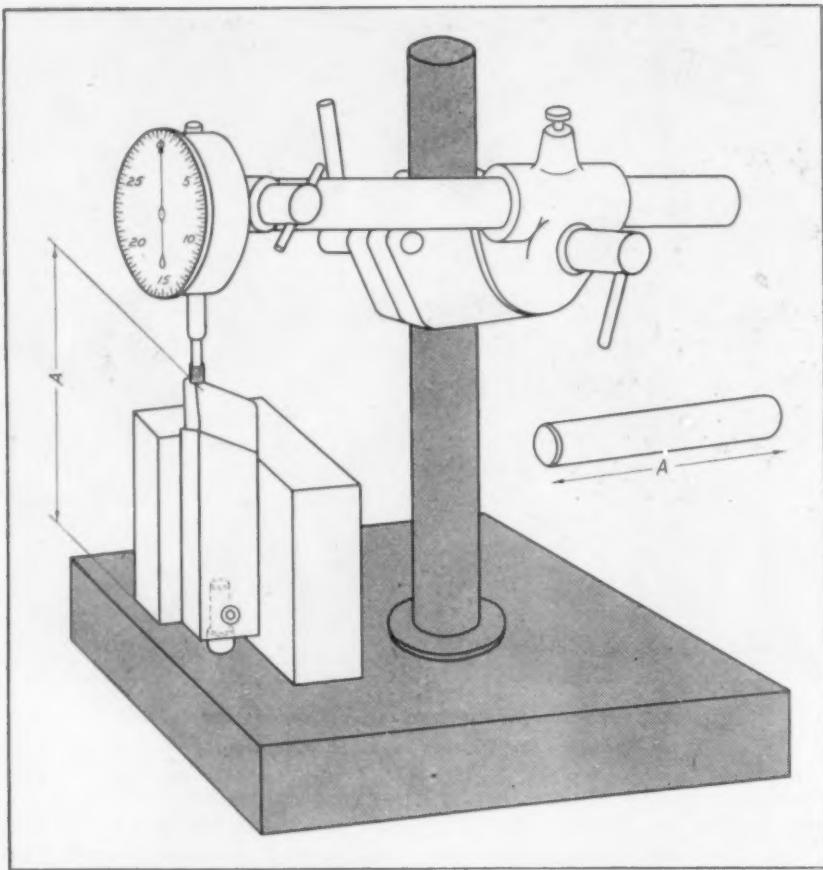


FIGURE 2. Tools are adjusted for setting in special boring head by means of dial indicator and master block.

necessary finish of the flange faces), the operation is performed in one-half the time by the above described method.

From this it would seem evident that ingenuity in the design of special tooling applications may be suggested as an effective approach to production problems of the sort that will be

encountered with increasing frequency during this interim period between the declining peak of war production and the onset of postwar output.

For the new era, of course, machine tools incorporating functions specifically adapted to the needs of that time will be available.

THE END

ELECTRONIC DRIVE Gives Old Machines New Life

WHEN it is impractical to obtain new machine tools, electronic control often provides old machines with greatly improved operating characteristics. The Axelson Manufacturing Company of Los Angeles recently installed Westinghouse electronic motor drives on three 30-year old Heald grinders, resulting in improved precision finishing; vibration-free, stepless, speed control over a 20-to-1 speed range; and better working conditions.

The electronic drive is a simple

unit, consisting of an electronic rectifier to change alternating current to direct current, plus a d-c driving motor with stepless speed controlled by a potentiometer in the push-button station.

At the Axelson Manufacturing Company, problems in machining hardened pump liners were augmented by specifications which require a finished tolerance of .001". The variation in liner sizes and materials used required grinding speeds over a wide, closely regulated stepless range to se-

cure the desired tolerance and finish. This stepless quality in speed regulation permits the operator to choose the right speed for size of hole, material to be finished and grade and grit of wheel. Having exactly the right speed helps to eliminate vibration and chatter marks in the work and gives a straight, true, round hole.

SAVINGS IN SPACE AND TIME

In addition to the advantages gained by providing stepless adjustable speed over a wide range, physical advantages were gained in the new layout of the machine. The three grinders were re-set on a 35° angle with a saving in floor space of about one-third. Removal of all overhead pulleys, belts and shafting resulted in increased safety, improved illumination and elimination of vibration. The time study department at Axelson reports an appreciable saving in setup time due largely to better lighting, plus less complicated controls and speed changing apparatus.

The machinist can pre-set work speed either before starting work or change speed while the electric motor drive is running. Since the speed change can be made smoothly, this can be done without danger of spoiling the work in process.

SPECIAL ADVANTAGES

Electronic motor drives can be compared roughly to the common variable voltage adjustable voltage drive, since a wide speed range is obtained and it operates from an a-c power system. Here the similarity ceases, because the electronic drive has many advantages not found in conventional adjustable voltage drives, including: (1) regulation that is effective in maintaining a constant motor speed with wide changes in load; (2) limitation of motor current to a definite maximum safe value; (3) speed control rheostats so small that they can be built into a push-button station; and (4) circuits that are readily adapted to coordinate with usual control functions.

The electronic drive consists of four essential units which are (1) a shunt wound d-c motor, (2) a grid controlled thyratron rectifier, together with the necessary auxiliary control tubes, (3) a separately mounted transformer, and (4) a push-button control station with speed control rheostats.

THE END

Flame Hardening Blanking Dies

LIN MAGER

TOOL DEVELOPMENT AND RESEARCH GROUP
NORTHROP AIRCRAFT, INCORPORATED

ECONOMY AND SPEED of fabrication are the principal requirements for blanking and piercing dies for aircraft parts. Searching for methods to meet these needs has led to the thin-die type of construction. Thin die steels, however, tend to warp during hardening by conventional means, causing excessive time losses in grinding after hardening.

For large dies where sectional construction is used, grinding and fitting of die steels after hardening is necessary. To avoid this, and to conserve tool steel, the practice of flame hardening the cutting edges of plain carbon die steels has been adopted.

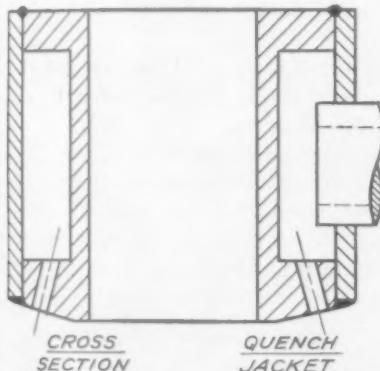


FIGURE 1. Cross-section of water jacket for quenching tip.

Flame hardening employs the oxyacetylene flame as a heating medium for surface hardening. Unlike case hardening, it produces no chemical change in the composition of the steel such as addition of carbon or nitrogen to the surface of the steel. Since only small portions of the surface are treated at any given time, warp and distortion are negligible. Plain carbon steels can be successfully flame hardened when the carbon content is above 0.35 per cent, best results being obtained in the range between 0.40 per cent and 0.70 per cent. Lower carbon content

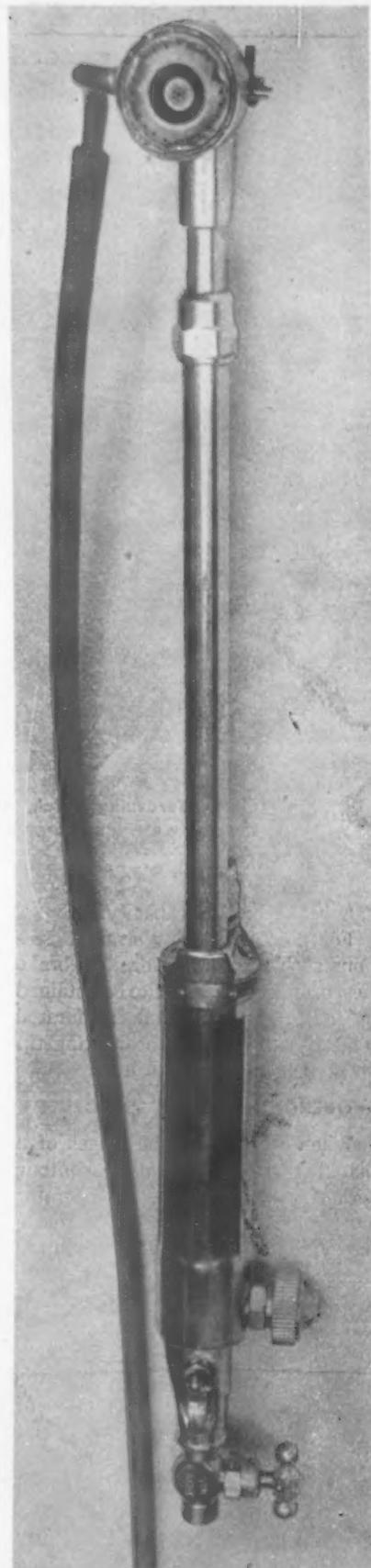
does not provide adequate hardness, while higher carbon content requires a great deal of care in hardening to avoid surface checking or cracking.

The die surfaces should be free of scale and decarburized zones; and surface imperfections, such as pits, seams, and blow-holes should be avoided, since they will usually cause cracking during hardening, or failure of the edge. The die steels can be completely finished, fitted, and fastened in place before hardening, thus making possible considerable savings in grinding and fitting.

Hardening is done with the blue cone of a slightly oxidizing oxyacetylene flame. To avoid the long flame of the welding blowpipe a multi-orifice tip, similar to a cutting torch tip, is used. This applies a temperature of about 6300° F to the surface of the steel and heats it considerably above the critical temperature, increasing the austenite grain size, which has an effect on hardenability similar to that of adding alloys. Proper quenching will then impart to the steel a high surface hardness and wear resistance comparable to case hardening.

REQUIREMENTS FOR COOLING

The quenching procedure is extremely important. The success of the quench is determined within the first few seconds of application. If the cooling rate does not exceed the critical rate at any one point, martensite will not form at that point to produce a soft spot. Consequently extremely rapid surface cooling is necessary, which for carbon steels can be provided by water. However, the method of flame hardening which submerges the steels in a tank of still water does not provide this rapid cooling. The flame tends to heat the water, constantly reducing the rapidity of the quench. If the cooling rate of water at 65° F is taken as 1.00, the cooling rate of water at 122° F is 0.17, and at 166° F it is 0.05 (American Society for Metals Handbook, 1939 Edition, Page 329). A constant flow of water must be used at about



Flame hardening torch, front view, showing water hose, quench jacket, and removal of pressure handle from standard cutting torch.

Facilitating thin die construction, flame hardening is recommended to prevent warp, save grinding to size. New design flame tip includes water jacket to permit careful control necessary to highly important quenching operation



Flame hardening torch, closeup, showing water quench attachment.



Side view of flame hardening torch, showing water hose attachment.

Northrop photos

65° F and in sufficient volume to provide heat-removing capacity.

For flame hardening straight sections such as shear blades or brake dies, proper quenching can be obtained by placing a horizontal, perforated tube directly behind the heating tip and piping tap water to it.

QUENCHING JACKET ON TORCH

When hardening the edges of a blanking die of irregular contour with this arrangement, the operator must move around the die or rotate the die to keep the quench behind the flame. To avoid this lost motion, the author has designed a quenching jacket that can be applied to any cutting torch tip and provides adequate quenching at any position of the torch. An enlarged scale section of this jacket is shown in Figure 1, and the accompanying photographs show the jacket and its application to a standard cutting torch.

Flame hardening SAE 1055 steel by this method produces a hardened surface of about 550 Brinell for a distance of .250" to .375" back from the cutting edge. Examination of a cross section through the edge of a

die steel .250" thick shows a total affected depth of 135". At the top is a thick layer of austenite, below it a zone of martensite .075"-.095" thick and below that fine pearlite and ferrite. In operation, the austenite cold works to martensite, with consequent increase in wear resistance. There are no sharp lines of demarcation between the zones, transition being gradual. Thus there is no possibility of the hardened surface "peeling" or chipping off.

COMPLEXITIES OF OPERATION

Successful flame hardening depends on the temperature of the zone being hardened. Applying the flame too close to the work or for too long a time will result in a burnt surface or in overhardening and subsequent surface checking. Rules for speed of tip travel and height above the working surface cannot be given because of the many variables involved. Much depends on the operator's ability to judge temperature accurately by the color of the steel. Normally, two factors make close visual color determination difficult. First, the temperature rise is extremely rapid—up

to 40° F per second; and second, the color of the steel is obscured by the flame envelope. This second factor can be largely overcome by providing the operator with purple lenses for his glasses which eliminate all colors but the reds and thus permit him to see through the flame envelope and note the color of the steel.

SPEED IS MAIN ADVANTAGE

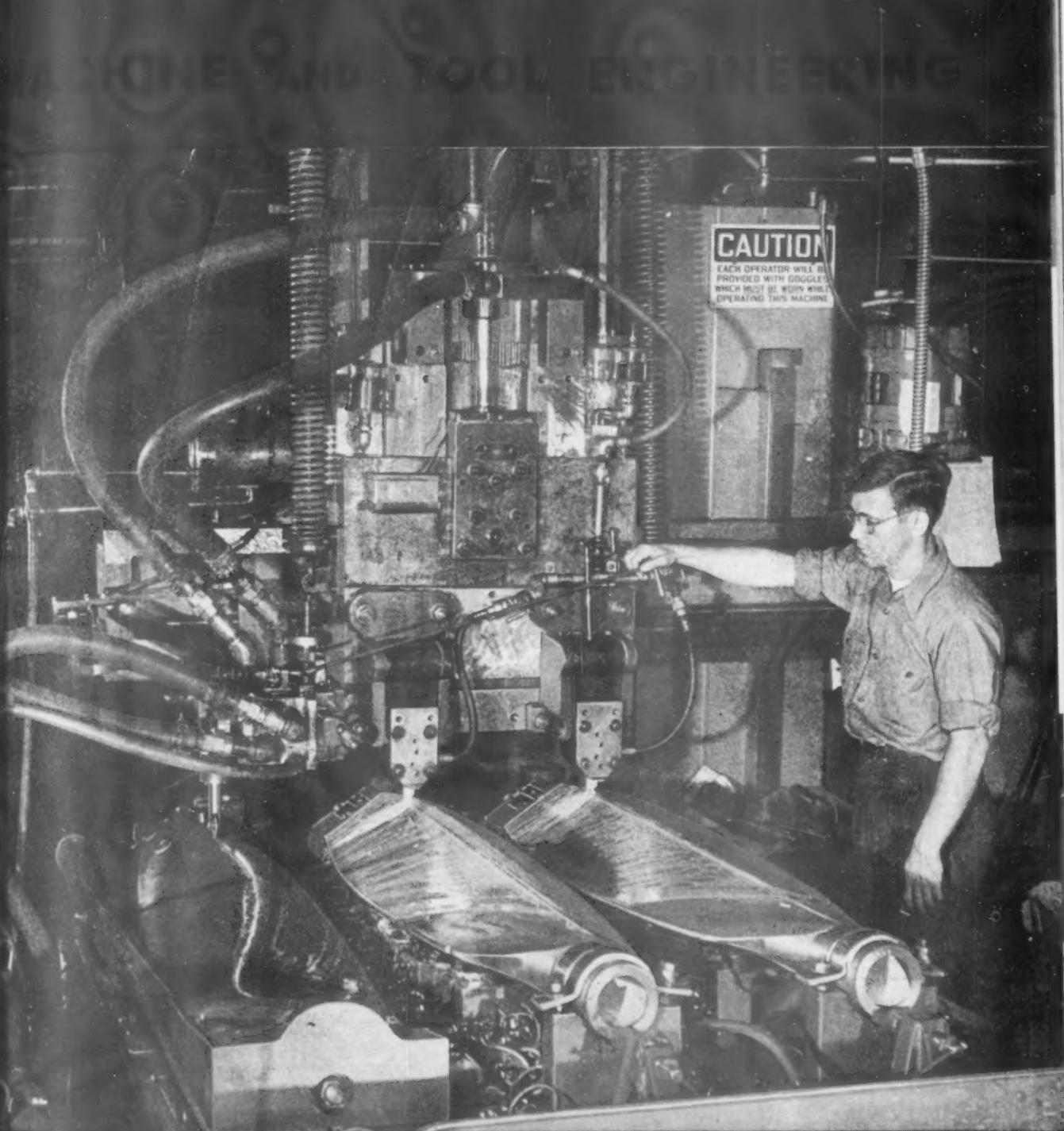
With a little practice any experienced welder can turn out consistent, quality work with this method. Its principal advantage is its speed, the time required to flame harden being only a fraction of that required for the furnace method. Another advantage is that die steels can be completely finished and fitted before hardening, and the flame hardening process will leave a clean, smooth surface ready for use, saving considerable grinding and fitting time.

While this method has been developed for plain carbon steels and thin dies, it can be extended to use with certain alloy steels for high production dies—a suggestion for speeding up tooling for reconversion.

THE END

THE TOOL ENGINEER

PRODUCTION



Platen, with hydraulic follower attachment, profiling two blades simultaneously.

PRECISE TOOLING FOR A PRECISION PRODUCT

Aeroproducts Division of General Motors builds propellers with both specialized and standard equipment; prepares a forging and a formed sheet for a brazing job involving 120 square inches on each component. Its techniques are broadly useful.

THE TOOL ENGINEER

Streamlined Production

Precise Tooling For a Precision Product

AEROPRODUCTS DIVISION of General Motors Corporation began mass production of two-piece hollow steel propeller blades at the start of the war in a new plant. It had suffered the conventional difficulties in obtaining machine tools and in training men to operate them. But the story of their production success, as it is recorded in present day results, involves far more than these obstacles which faced most war industries.

Production-wise, a propeller blade does not have a beginning or ending. Linear measurements are practically non-existent. Yet it must be produced to a fineness that is usually described as being "on the button."

The plant produces blades, hub, and small components, which with certain items supplied from the outside, it assembles for installation in several fighter planes and bombers. The blade is made of two components, the main part being a machined forging to which a pre-formed sheet is brazed. The forging includes the shank or root end, the flat face, an inner longitudinal rib and reinforcing sections along the leading and trailing edge. Between the rib and edge sections are cavities which are machined out. The rough forging which is SAE 4340, weighs 190 pounds. More than two-thirds of this metal is removed in machining processes.

PIONEERING METHODS

Though not as difficult to produce, the propeller hub imposed problems which caused machine tool manufacturers to pronounce it the toughest which had come to their attention. It is machined from an SAE 4340 forging to precise dimensions.

Reviewing their experience in developing techniques and methods for the manufacture of the blade and the hub, this company's production engineers will say that they had to pioneer a brand new manufacturing method for a product that no one knew anything about. There is a basic method which is correct today, however, and they have established it. Aeroproduccts management has introduced machining methods of such accuracy and efficiency that hand grinding time has been cut from 30 hours to 6-1/2 hours, and there are signs of whittling it further.

Smooth and steady flow of work can be attributed to the attention paid to every detail of each process with regard

to establishing an "abc" routine for each operation. Process specifications must be followed rigidly to maintain production, as scheduled for required output, and as economical for the machines, tools, and fixtures involved. Process specifications contain full information, specifying the materials required, such as coolant, hand tools, gages, cutting tools, and a schedule for maintenance. Details of setup, operation of equipment, depth of cut, speeds and feeds, are all included in proper order of execution.

FLEXIBILITY OF TOOLING

Perhaps the most amazing aspect of the overall picture concerns the flexibility of equipment which has most of the attributes of special purpose design, yet handles several product sizes and shapes. Though jobs demand the same processing, in the same sequence, there are enough variables so that no plant would be criticized for setting up separate lines. In this instance, where single line mass production has been developed to a high degree of efficiency with roller conveyors feeding successive batteries of equipment, an outstanding job of production engineering must be recognized. One further tribute must be paid to the accomplishment. Processes have been engineered to obtain the benefits of machining for interchangeability, yet to a limited extent each blade must be custom-produced to obtain balance which recognizes differences in distribution of mass. A variation of .001" in thickness of the thrust plate involves 100 ounce-inches of material. Ingenious staging of operations, whereby temporary balances are struck, each narrowing the margin for cleanup toward achieving final balance, accounts for the successful development. Obviously, the establishment of material removal limits for each operation is also an important factor.

All in all, the story is best told in a description of production operations. Though it concerns a highly specialized product design, there are ideas which are applicable to a broad cross-section of the metal working field. Typical are the use of planers for highly accurate contour forming or profiling, and the development of a brazing process which joins the pre-formed camber sheet to the thrust-member, involving approximately 120 square inches of surface on each component.

SPECIAL FEATURE BY THE EDITORS

BLADE FABRICATION

THE 190-POUND thrust-member forging, 70" long, is received from the supplier without locating bosses or other aids to processing. Roughly, one side of the forging conforms to the "flat" outer side of the blade. The other side consists of large relieved surfaces, separated by the longitudinal rib and edges, representing the cavities of the hollow blade.

The first job consists of determining where to begin by establishing dimensional centers which will be used in machining, and of checking stock thickness to learn whether the forging comes within limits specified. Special fixtures aid this operation. A necessary tolerance is permitted because before the blade is finished, new dimensional centers must be allocated in correlation with the mass center.

Centers are determined by aligning the blade between rows of plug pins set in parallel angle plates which are mounted on a surface plate. Each angle of the blade pitch carries a vertical row of two or three pins, with each row marking a 3" station. When opposed pins are advanced to predetermined positions, the space between represents the desired thickness of the forging at a particular location or station. The outer faces of the bushings through which the pins slide are stepped, the difference in the two surfaces equalling the tolerance allowed. The pin is in proper position when advanced so that its end lies within the step. Naturally, adjustment of pin is permitted within this tolerance indicator.

ESTABLISHING CENTERS IN FORGING

The blade is suspended between the angle plates, the shaft end resting in V-blocks and the lower edge supported on a knife edge. A clamp at the shaft end can be adjusted to permit changing the angle of the blade with respect to the shaft axis. Linear adjustment is obtained by moving the V-blocks and knife edge through a worm gear mechanism.

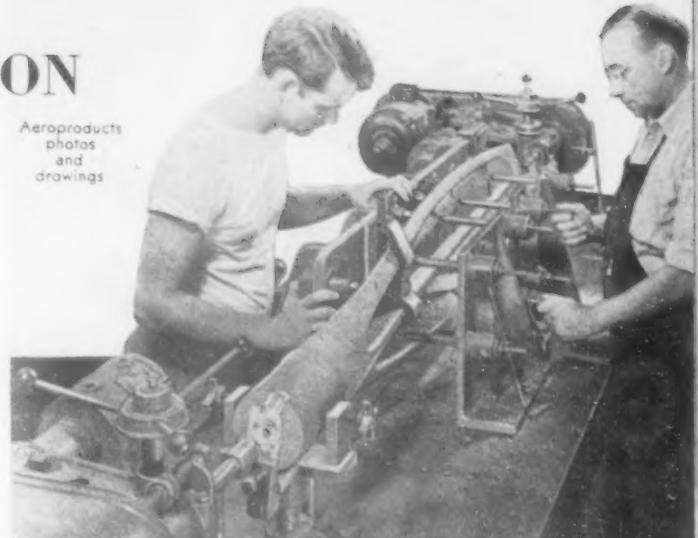
The blade is first adjusted to locate firmly against two solid buttons which form a line representing the 36" station on the blade—the only location on the entire contour wherein the rib is at right angles to the thrust face. Plug pins facing the inner or camber side are then advanced against the rib and cavity surfaces, and the blade is pivoted around the 36" station until all stations check as closely as possible. Pins are set to afford every advantage in controlling the more difficult machining job of developing the inner side of the blade. Thus the heaviest stock removal, within allowable limits, is consigned to machines forming the outer side.

When the angle and curve of the inner side are checked, plug pins are advanced against the outer side to check stock thickness. If the checking process indicates warp or twist, slight distortion can be corrected in a press operation.

When the forging has been correctly aligned in the fixture, clamps are tightened and holes are drilled in the shank and tip to indicate initial machining centers. The drilling operation is performed by two single spindle drill presses, mounted horizontally, at each end of the checking fixture.

The first machining operation consists of turning down the hub root, or shank, of the blade, and turning a wide

Aeroprod
photos
and
drawings



Rough forging of thrust member of blade is checked in fixture to determine centers which are then drilled.

flange known as the cuff ring which becomes a locating surface for following operations.

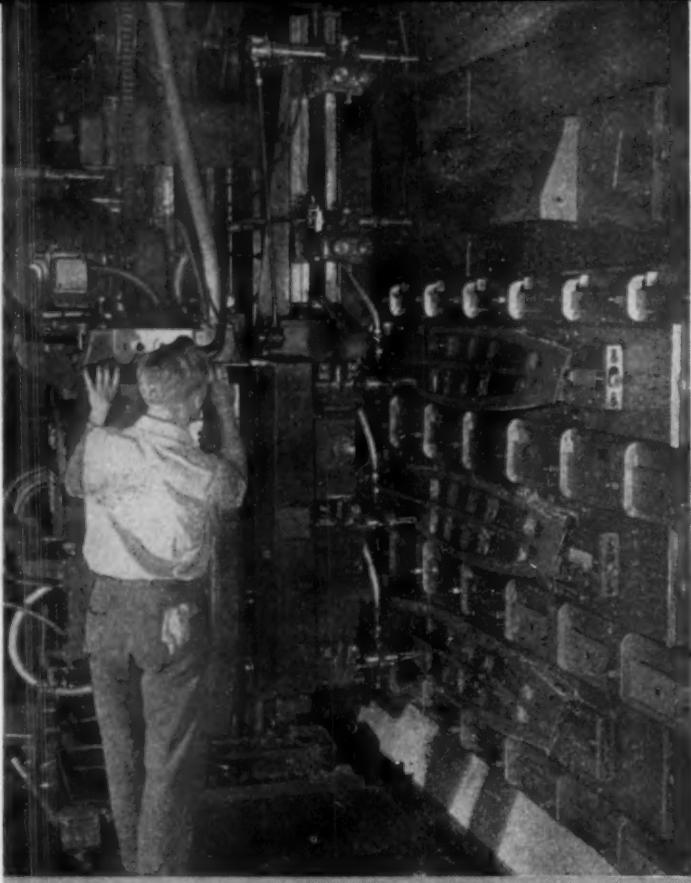
The cuff ring is located with reference to the 36" station used as a reference point in checking stock thickness. A steady rest at this station serves to hold the 70" blade, against a tendency to whip, and has resulted in increasing turning accuracy from .010" to .002". A standard lathe has been adjusted so that the center line for turning is 2" higher than normal. Because the cut taken on the root progresses through the fairing of the blade edges to the constant diameter of the root, contour control is required. A cam controls hydraulic actuation for the position of the cutting tool.

Most interesting phase of this operation is that carbide tools are used to perform an intermittent cut of rather unusual proportions on the edge of the blade. The opera-

Contour milling plan-form on blade forging, one operation.



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Profiling cavities in the blade forging on conventional duplicating equipment. Note production setup.

tion begins by turning a diameter of 9", or a perimeter of approximately 30", though only two or three inches of surface are presented to the cutting tool. Where high breakage had resulted from this operation, 110 pieces are now machined, and the tool is taken off only for grinding. Selection of the proper grade of carbide and provision of a chip breaker solved the problem.

The second machining operation consists of milling the edges of the forging to develop the plan-form of the blade. The part is passed between cutters mounted on vertical spindles, and it progresses so that the parallel edges are always perpendicular to the table at the point of cutting. Spindles are advanced in and out in conformity with specified contour. One cam controls the angle of the blade, and another controls spindle travel.

A 3" hole is next drilled in the root to a depth of 16". The hole ends in a cone which must be located concentric with the blade edge within .020". Drilling a hole of these proportions in the tough forging requires a stepped operation. In this instance, available horizontal lathes were converted to the job, five of them being set up to perform the series of operations. The work is held stationary on the tables and advanced to the tools which are revolving in the lathe headstocks. The tool devised for the operation is a "spade drill" which actually performs an internal turning operation. It is a two-bladed cutter, stepped from a point to full diameter. A heavy flush of coolant

washes chips out of the hole.

The tool is held in a "boring bar", which is of adjustable length, both with respect to different root lengths and to offset differences between the cuff ring used or location and the root end. In one of the operations, four stepped facing tools mounted in the head around the boring bar, combine with the drilling operation to face the hub end down to a specified distance from the cuff ring.

Operations are balanced to even up stock removal. The lathes were converted for simplified actuation, tail stocks were removed, and the frame end was set in a concrete block to supply required rigidity for the heavy metal removal. The end of the blade is centered in a small tail stock which travels in V-rails mounted on an extrusion, for alignment purposes.

Planing operations are perhaps the most spectacular of the machining jobs. A detailed description of the technique is warranted because of the importance of their accuracy to brazing operations. They consist of removing metal to produce specified contours by means of hydraulic duplicating mechanism. In the master and follower setup, the follower consists of 2½" diameter wheel. The master must be developed or modified to compensate for differences between the axis of the follower, to which the single point tool is set, and the perimeter or travel of the wheel. Parts are planed two at a time. Up and down



Bridge and template combination used to check surface contour after planing blade.

action of the follower actuates a piston which opens and closes ports in the hydraulic system actuating the rise and fall of the planer head.

Improvements in the direct hook-up between the follower and valves for rapid porting of fluid in the hydraulic system have shown two distinct benefits. First, greater sensitivity has speeded reaction in the rise and fall mechanism on the planer, permitting increased speed in table travel. Where 18 feet per minute was originally used, speeds of 40 feet have proved practical in experimentation. Second, increased sensitivity has permitted use of much lighter pressures in the valve and follower combination. One benefit of this has been the use of non-metallic, cast masters which tended to break down under previous pressures, which ran as high as 70 pounds, but are satisfactory under present 20 pound pressures.

Planer tools and follower rollers are designed to the same radius to provide perfect reproduction. (See page 82). Each time tools or rollers are changed, their spread is

Streamlined Production

checked with spread gages. Because this relationship is important, planer operation is not permitted if there is side play in the clapper box.

In planing the flat side of the thrust member forging, the part is located by placing the cuff ring against a block and tightening centers. A magnetic chuck is used to maintain alignment of the work on the planer table. Heli-cal wedges at regular stations can be pivoted to meet blade contour, providing full support, and to obtain proper levels and angles.

The number of cuts which are taken depends upon the amount of stock to be removed. Excess over a specified range of $1/16$ " is marked on the blade at the time of checking the thickness of the forging. A bridge template, with flush pins installed, is used to check metal removal requirements.

A minimum of two rough cuts and one finish cut is taken, with cross feeds amounting to $.050$ " for rough cuts, and $.030$ " for finish cuts. Depth of cut is gaged so as to leave $.090$ " (plus $.010$ " minus nothing) after the first rough cut, and $.040$ " (plus $.005$ " minus $.005$ ") after the second rough cut. Cutting stroke is between 37 and $37\frac{1}{2}$ feet per minute. New tools are installed for the finishing operation.

VISUAL INSPECTION OF CONTOURS

Visual inspection of the work includes use of bridge templates at stations 3" apart. Rather rigorous control is imposed on the use of templates and on their maintenance. Tolerance of contour as checked with templates cannot exceed $.008$ " per inch chordwise, $.008$ " per 3" longitudinally.

With the planing finished on the thrust side, the blade is moved to a second machine for planing of the cavity side. At present, only the ribs, or brazing surface, are machined on planers. Changes are now underway to permit planing of 75 per cent or more of the material in the cavities. A change is also planned for streamlining work holding methods. At present, the thrust side is bolted to a fixture for planing and for the profiling of the cavities. This necessitates soldering bolts to the thrust side, mounting in the fixture, and tightening nuts down over the bolts. A magnetic chuck setup will permit easier handling of the work from one machine to the next, thereby

Hand grinding camber side, or cavity surfaces of the forging after machining.



Streamlined Production

eliminating the heavy holding fixture.

Rib surfaces are planed in much the same manner as is the outer surface. Roller conveyors feed the work to the battery of planers set up to perform this operation. The master is developed with respect to the camber side of the blade, the follower passing over the entire surface. However, because only the ribs and supporting edges are machined, the tools do not cut during the major portion of the stroke across the cavity surface.

The projected planing of the cavities, mentioned above, is highly practical for two reasons. First, the tools are in motion the same as they would be were they cutting through their entire stroke, so that no additional machine time will be consumed. Second, the surface resulting from planing is superior to that produced by conventional profiling machines. Less hand grinding to finished dimensions will be required.

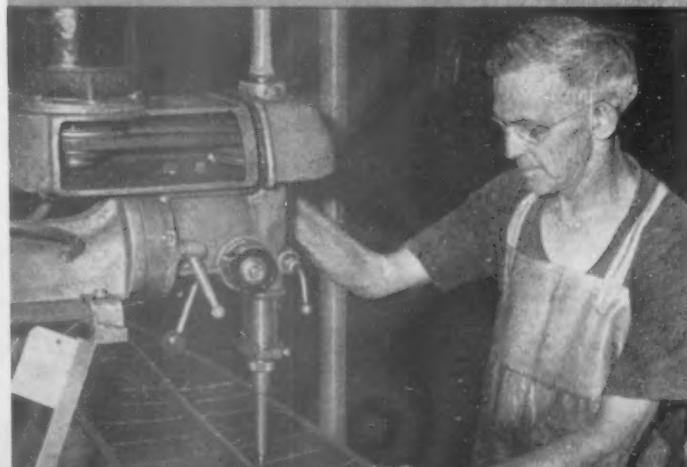
In the root end of the blade, however, contours are too sharp for accurate application on the planer, so that profile milling will still be required.

Because the planer master cavities are designed to the specifications of the shortest blade produced, profile milling is also required to finish the ends of the longer blades. Here the proportions of handling and movement of equipment are weighed. The masters weigh 2200 pounds. The problem is one of changing masters for each blade, or removing more metal on some blades in the profiling operation. One more variety of job consists of profiling under cuts at the root end of large-sized blades to lower the weight of the part. This is a standard profiling operation, on a 3-spindle duplicator.

Profile-milling of the cavities is performed on 3-spindle equipment (similar to the single spindle equipment used in die shops,) incorporating the use of two masters, one for depth control, one for contour development. Though cast iron masters were first developed, these have been replaced when worn with a plastic.

With rough machining finished, the blade is marked with a skeleton template to indicate six points in line at

Spot drilling machined forging, before hand grinding, shows how deep hand grinder should penetrate.



Streamlined Production

each of 13 stations. This is followed by drilling holes at each point to a depth which represents the difference between the machined blade and specified thickness. An ingenious fixture has made this operation semi-automatic insofar as gaging drill depth is concerned.

The blade rests on the thrust side, the section directly under the drill press spindle being supported on a pin which is raised to pre-determined positions so as to set the distance between the cavity side and the drill spindle, thus establishing the depth to which the drill will penetrate. The pin is rotated around a threaded spindle to these positions, each position being correlated with a particular station on the blade.

Rotation to each successive position with each shift of the blade from the root end to the tip, raises the blade so that holes are drilled nearer to the camber side indicating less thickness. Handling of the work is facilitated by supporting it in a sling hanging from a monorail conveyor.

HAND GRINDING FOR FINISH

When holes have been drilled to proper depth at nearly 80 stations or points, the blade is ready for grinding to correct depth. By obliterating the drill marks, the operator knows that he has produced a blade of proper thickness within the limits set for this stage of the operation.

With the thrust side of the blade ground to a semi-finish specification, the cavity side is ground and polished to dimensional and finish specifications. Contours are checked with templates. The hand grinding process includes the use of hard wheels to remove tool marks, with soft wheels serving to finish the surface. Because of the limitations of developing accurate dimensions by hand grinding which can be checked only by templates, the importance of accurate planing is obvious, particularly on the rib and edge surfaces which must mate perfectly with the camber sheet if a perfect joint is to be obtained in the brazing process.

In brazing the camber sheet to the thrust member to form the two-piece steel propeller blade, Aeropproducts production engineers have made broad strides in a field which is becoming increasingly important to mass-manu-

facturing. Important factors which have required careful development are the preparation of the workpieces, application of brazing metal, design of a brazing fixture, brazing atmosphere, and application of pressure to the joints.

The camber sheet, which is rolled from the same SAE 4340 used in the forging, is formed to the required contour in a series of operations including blanking, cold forming, and hot forming. After pickling, the inside surface is polished to finish specifications.

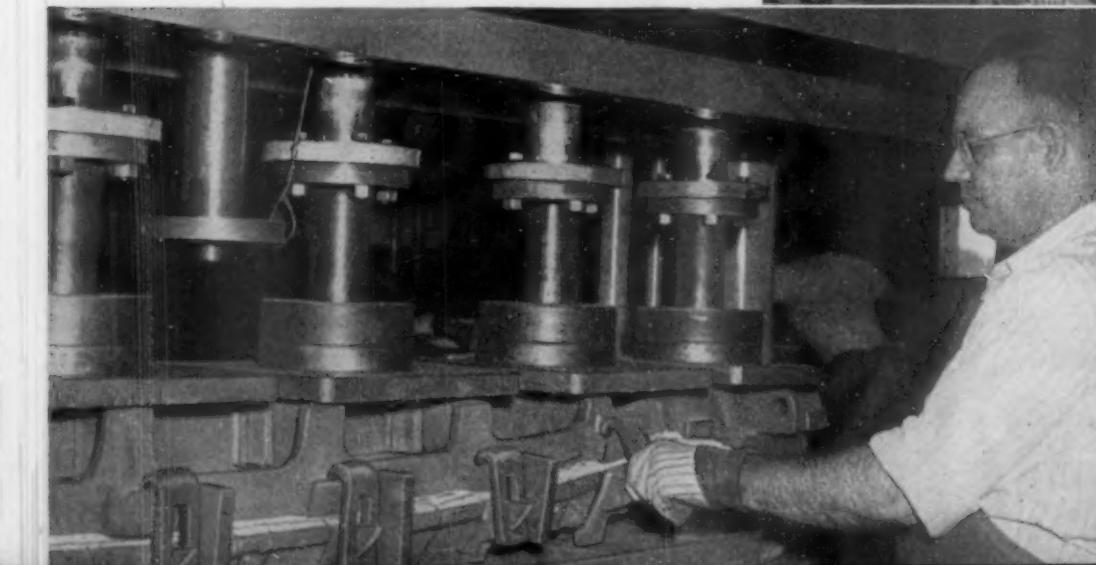
Mating surfaces of the thrust member and the camber sheet (on the thrust member, these are the longitudinal rib and supporting edges) are prepared for brazing by grit blasting with the cavity surfaces masked. Grit blasting serves to effect bonding of the sprayed metal and to clean the metal surfaces preparatory to brazing. Care is taken to protect cavity surfaces because fatigue resistance would be lowered in that the part has not been heat-treated.

Departing from customary methods of applying copper for the braze, Aeropproducts process engineers found economy of movement and improved quality in the bond by spraying copper on the mating surfaces. Thickness of the application ranges between .006" and .010".

Development of a brazing fixture required intensive study and experimentation. The equipment in use today has resulted from the application of the combined experience and ingenuity of several individuals. The fixture consists of upper and lower shells which contain cavities conforming as perfectly as possible to the outside contours of the blade which is sandwiched between the halves. Problems of design included provision of a heat resisting alloy, reinforcement against warping or cracking, and application of pressure required for a good brazing joint.



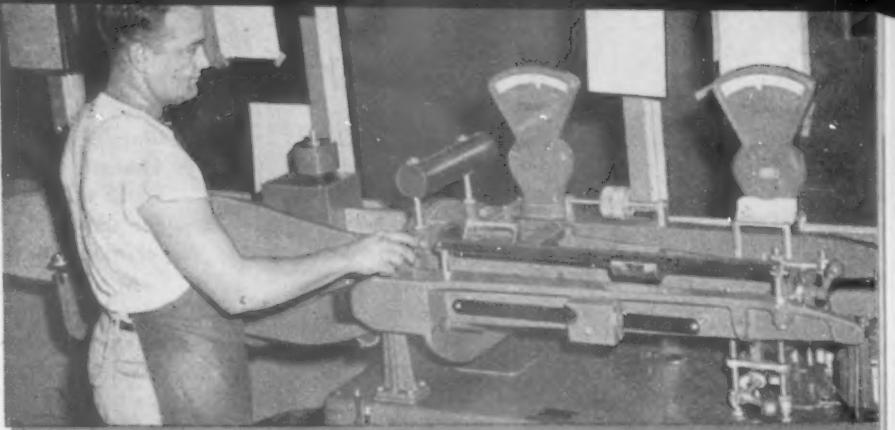
Above: Three brazing fixtures, containing ribbed-steel blades, ready for brazing in furnace.



Left: Closeup of a brazing fixture with operator putting on link which expands, increasing pressure.



Testing thickness measurement on Soni-gage, developed by General Motors.



Balancing fixture determines mass distribution, longitudinally and transversely. Blades must be balanced for perfect performance.

The problem of finding an alloy was solved with a 20 per cent nickel, 25 per cent chrome casting. The test of practicability was made largely in experimental casting. If the fixture came out of the foundry straight and true, it was probable that it would not suffer unduly in the brazing furnaces. The same test was applied in designing the fixture. Corrections in placement of structural ribs and masses to offset distortion were determined by the condition of the trial fixtures when they were removed from the foundry sand. Distortion of $\frac{1}{4}$ " from end to end is permitted in the brazing process.

Successful brazing demands a full bearing or contact in holding the machined forging and the camber sheet firmly together (emphasizing the importance of accurate machining). It also demands tight joints, extremely tight if possible.

BRAZING THE PROPELLER BLADE

Design of the fixture used in brazing the propeller blade provides for development of extremely high pressure on the joints by means of clever attachments to the fixture. The attachments operate solely under the expanding and contracting actions produced by changing temperatures. They consist of links which hook over ledges on the upper half of the assembled fixture, and are slotted to fit over curved projections on the lower half. Under 10-ton press pressure on the fixture, the links can be fitted only partially over the curved lower edge of the projections, and hang outwardly at an angle. However, under brazing heat, the links quickly expand, permitting them to drop entirely over the projections, and hang vertically. When the fixtures leave the brazing furnace, blasts of cold air on the links contract them so that the fixture halves are pulled together with even greater force than was exerted under the press. The entire inner part of the fixture is still at brazing heat, so that joining is completed under the most favorable circumstances—high heat and extremely high joining pressure.

Other details of fixture design include use of asbestos rope directly under the brazing surfaces, as well as sheets of asbestos between the fixture and the parts. Such provision affords a slight give and take so that pressure is evened out in the event that the part or fixture warp slightly in pre-heating. It also permits increasing the pad slightly where a close joint is not obtained under press action. This is done by slipping extra thickness of asbestos under any opening indicated by a .010" feeler gage.

Fixtures rest on skids which move along a roller conveyor from the assembly station to the press. The press consists of four rams with plates on the bottom of the rams, applying equal pressure along the entire top surface of the upper half of the fixture.

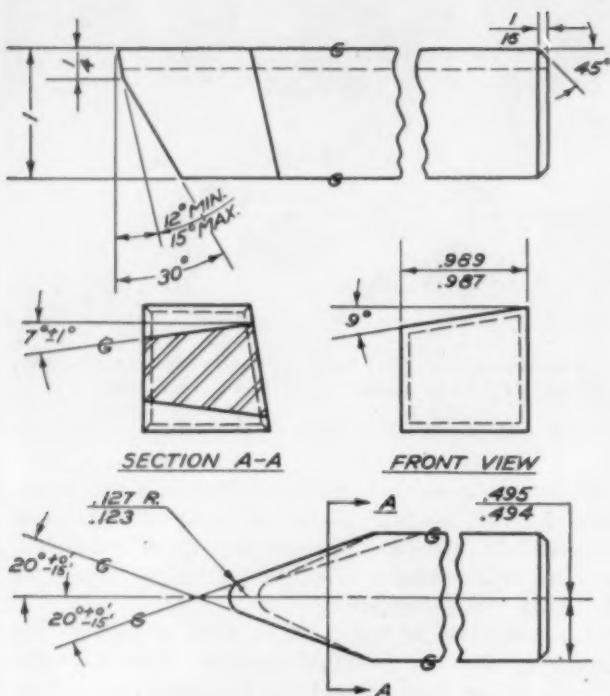
A continuation of the conveyor leads directly to the furnace door and a modified conveyor there takes the parts in lots of three through the heating cycles. Two preheats of 40 minutes each and a 10 minute brazing heat at more than 2000° F complete the process. Fixtures are conveyed through the 140-foot furnace on rollers which maintain a back and forth movement so that total travel is considerably more than would be required to traverse the furnace length. Reason for this is that slow movement would maintain the fixture weight on one side of a roller for too long a period, and the roller would quickly bend under the load at the high heat which the electric hydrogen-atmosphere furnaces develop. As a further precaution the fixtures are lifted off the rolls in the brazing chamber during the soak period, to prevent the rolls from sagging. Brazing gas consists of 12 to 15 per cent hydrogen, and 10 to 12 per cent carbon monoxide. Carbon dioxide is held to less than one per cent, and water vapor to zero dewpoint.

A short run through a cooling hood leaves the fixture and parts cool enough to be handled.

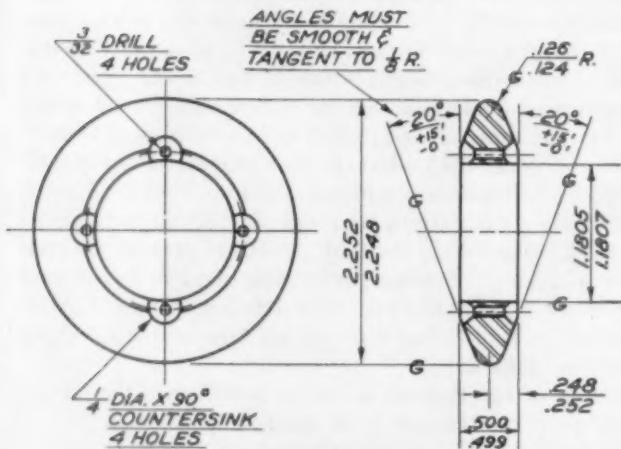
Ninety-six per cent of the brazed blades pass an inspection which includes tapping with a ball peen hammer to sound the joint, hydrostatic test, and probing with a feeler gage. This percentage also includes blades which pass through heat treatment without indication of poor joints which are exposed by discoloration.

Following inspection, the parts are ground for clean-up prior to heat treatment. Carburizing at temperatures above the 1475° critical is followed by quenching in sizing dies at 500° under 140 tons pressure (800 pounds psi). The blades are placed in the dies, plugged at the root end with a valve, and inflated with nitrogen gas to a pressure of 75 pounds per square inch while red hot. Any warping or twisting in brazing or carburizing is corrected in these quenching dies which serve to cool the part rapidly to a point below the critical, yet still provide sufficient

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**Planer tools, used in profiling the blade.
duplicate radius of follower.**



**Follower used on hydraulic attachment
for planer profiling device.**

heat for the forming or sizing process. Six presses are operated from a central hydraulic unit to maintain production.

Blades are drawn at approximately 1070°, slight variations depending on the heat experience. The objective of treatment is to produce a part testing between 28 and 32 on the Rockwell "C" scale.

With a plug in the root end of the blade, the parts are pickled under five pounds internal pressure. This means is sufficient to assure no leakage of acid into the inner surfaces.

Before final machining is performed on the outer sur-

faces of the blade, a minimum of hand work is required to "bump out" small irregularities. Further preparation for final machining consists of establishing new locations which will respect the mass center of the blade, rather than the dimensional center. Thus machining will bring dimension into conformity with the balance of weight.

Mass center is established simply by balancing the blade on a horizontal axis. When balanced, a process ring, which respects the mass center, is clamped onto the blade. A second point on the centerline established in balancing the blade is drilled into the tip. The part is then located in fixtures for final machining of the root end in a series of automatic lathes, including turning the O. D., boring the I. D., and producing a finished tapering contour in the bore. In this last operation, tool actuation has been simplified, a cam control raising and lowering the boring bar through simple drawbar linkage. Previously, a rather complicated mechanism was employed to expand and contract tools set at cross angles in a hollow extension from the spindle. The difficulties in holding tools for steady, accurate cutting are obvious.

Though the mass center has been changed with these machining operations, it conforms more closely to the new dimensional center which is established than it did to the old center. Finish grinding, preceded by careful balancing, brings mass and dimensional centers so close that any remaining off-balance can be corrected by the addition of a slight amount of weight in the hub, to one side or the other, and by grinding either side of the tip. However, before this is done, the interior of the hollow blade is grit blasted to remove fillets which may have been produced at the brazed joint, and the balance cup which carries weight for the finish balance is installed. Grit blasting is applied by lowering the blade over stationary nozzles which project grits directly at the joints. Ricochet of the grit has a beneficial scouring action on the remaining surfaces.

SEALING THE BLADE

The interiors of the blades are then de-hydrated by heating under infra-red lamps at a temperature of 350° to 380° for a period of eight minutes. While still hot, rust-proofing solution is applied to the inside, the heat serving to set the solution. The balance cup which seals the blade is quickly installed by pretinning the inner surface of the root, placing the cup by setting the root cavity over a fixture holding the cup in inverted position. By applying a pre-determined pressure, cups are forced into a position of meeting equal resistance, and thus secured.

Final operations on the blade consist of perfecting balance by a compromise between metal removal by grinding and adding small amounts of metal to the balance cup in the root cavity. Actual balancing operations are performed on a pendulum fixture and on a device incorporating scales which measure inch-pound eccentricity from the longitudinal and transverse axes.

Final metal removal includes a series of centerless and internal grinding operations to finish the root end. The blade is mounted in a shuttle which provides clamps and cylindrical surfaces for supporting rollers in centerless work. Installation of the blade in the shuttle requires correlation of the mass center of the blade with the dimensional center of the shuttle. This is achieved by aligning a scribed center in the tip with a tell-tale marking the shuttle center and aligning the root end to the shuttle with

Streamlined Production

dial indicators.

Metal may also be ground from the sides or tip in accordance with indications noted in balancing. Addition of molten lead to the balance cup is quickly and accurately accomplished by pouring weighted amounts into marked sections of the cup as indicated.

Following final grinding of the root end, one further production operation is performed consisting of drilling dowel pin holes for assembly to the propeller hub parts. Because of a close concentricity requirement, this operation is necessarily dependent upon final establishment of the hub O. D. Clamping to the O. D. for concentricity and to the 42" station for location, the fixture provides for multiple drilling. Holes are drilled to lineup in assembly with only .0005" clearance with the dowel pins in the hub. The entire torque of variable pitch action during blade revolution is borne by these dowels which refer the blade to the hub mechanism.

HUB FABRICATION

CLOSE LIAISON between product designers and production engineers has resulted in high output of three styles of propeller hubs, as well as a maximum of production economy. From rough machining on single purpose equipment to finish grinding, all hubs travel down a single line, moving on roller conveyors at machine table or bed level.

Three-or four-socket forgings, with sockets cored, are first machined in a battery of special multiple station machines. First two jobs call for clamping the awkward shape of the forging in a loading station on a vertical eight-station machine. Rough facing, boring and counterboring are performed on the front cross-bore. On the next fixture, locating from the front cross-bore face, the rear cross-bore is machined similarly, including turning a taper on the O. D. A third step is made to broach a locating keyway in the center cross-bore.

Because of variations in forging, hub sockets vary as much as $\frac{3}{4}$ " in length, with respect to the cross-bore center line. A heavy-duty special purpose machine with

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In final inspection, every dimension of the blade is checked and recorded in a folder which accompanies the blade. Thickness is checked by measuring the frequency of an electrical current traveling through the blade walls. This instrument is called a Soni-gage and was developed by G. M. for this operation, as no commercial instrument is available. This instrument measures thickness from one side of metal and works on principle that the frequency of vibration is a function of thickness. Magnaflux tests check the material. With the addition of a threaded band, or circular nut, and plating, blades are ready for assembly. In their final dimensions and balance, with the nut installed, they are interchangeable.

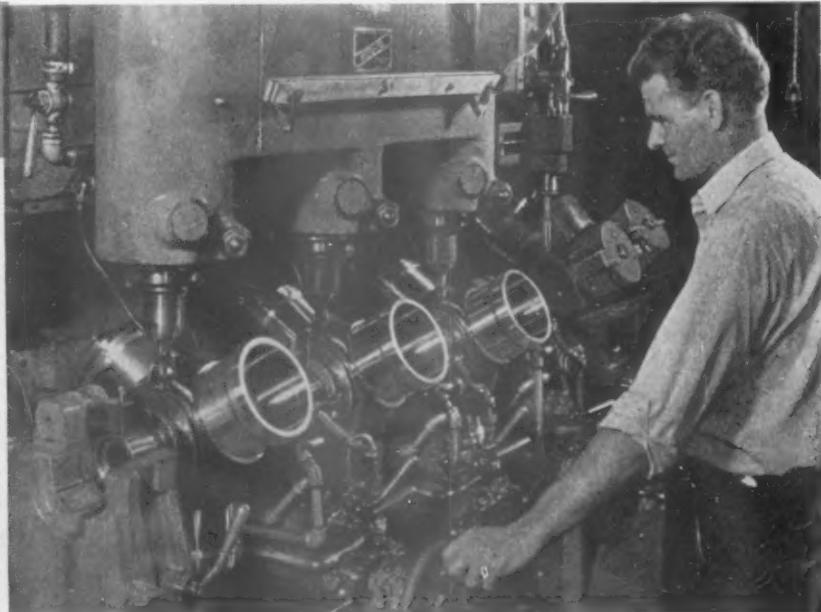
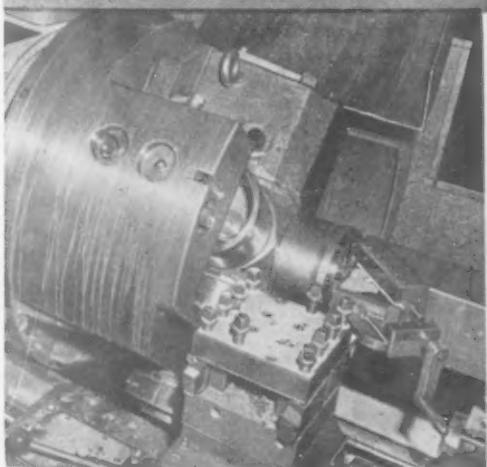
horizontal ways, corrects variations. Locating from the cross-bore—a stud picks up the centerline—the part is carried through five stations for removal of excess stock. This includes facing the end of the socket and drilling and boring the pierced core. Four-socket hubs are run through the sequence four times, the operator indexing the work on the clamping fixture after each completed cycle.

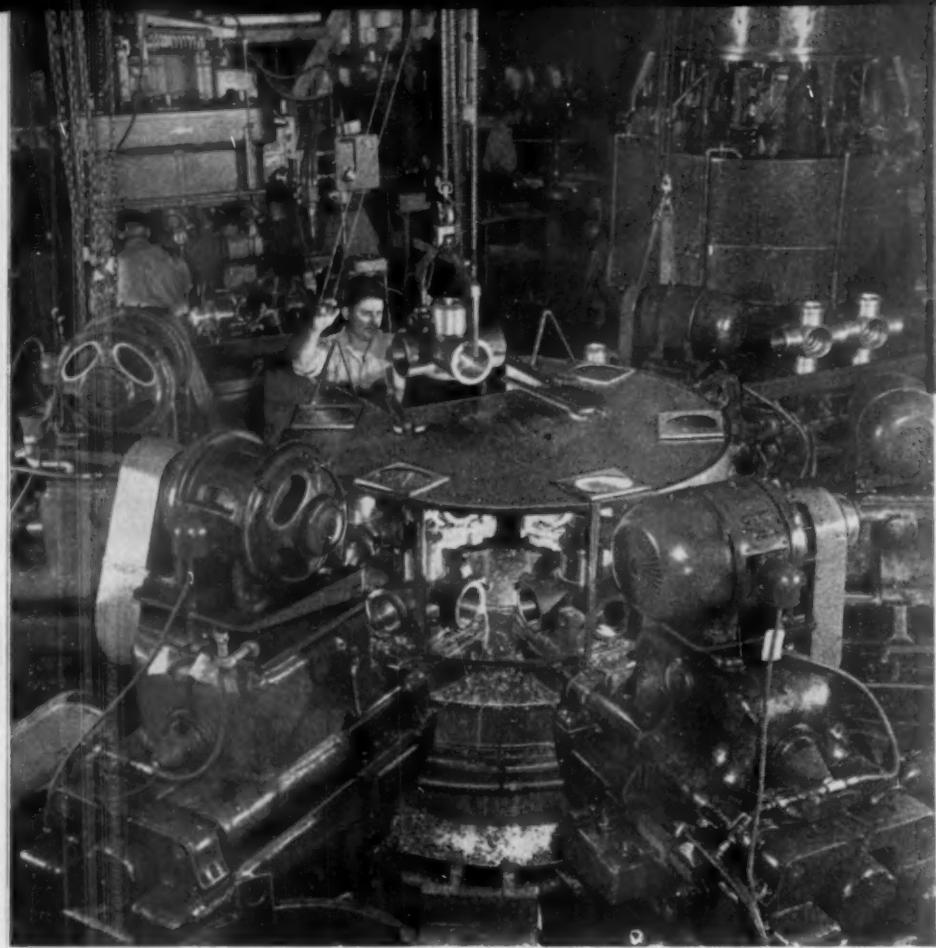
Finish machining on the O. D. of the cross-bores, front and rear, is performed on two special purpose machines, similar in design to the first two employed. Special arbors, which seat to a taper in the rear bore and are keyed to the slot broached through the center of the bore, carry index buttons which permit close centering of the part. Precise location is required to develop good concentricity in turning the O. D. The tooling setup requires careful adjustment of the cams which control the advance of the tool slides. Operations include stepping turning tools in from an advance on a vertical slide to undercut a flange.

With 80 per cent of the excess metal removed from the forging, the part is sent to heat treat, where hardness is

Right: Profiling junction of hub sockets on a 3-spindle, standard machine.

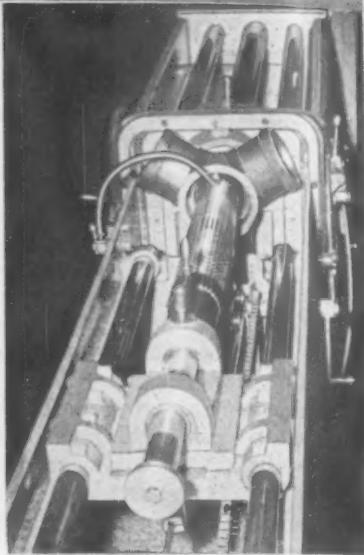
Below: Indexing fixture holds hub in lathe. Locating adjustment shown on exterior.





Automatic machine hogs metal off rough forgings, preparatory to a more accurate machining job on automatics shown in background.

Below: Horizontal pull broaching machine produces spline in hub cross-bore. This is a key operation in production of the hub.



raised from an annealed state to 32 to 34 Rockwell "C".

As with machining the propeller blade, a careful balance of metal removal must be maintained, each operation leaving enough stock for cleanup in relation to dimensions or centers established as the work progresses. This is particularly true in machining the bore, which includes broaching the spline in the center. First machining operations after heat treat are performed on a turret lathe and consist of boring the cross-bore to provide location for the pilot of the broach. Next the front end is faced perpendicular to the pilot bore, an important operation in that this surface must bear accurately in true 90° relationship against the fixture in the pulling operation. On the same turret lathe, the front cross bore barrel is grooved close to the end to provide a hold for chucking fingers in following operations.

BROACHING THE HUB

In broaching, a horizontal pull broaching machine is used. Rough and finish operations are performed, requiring use of two broaching tools for each of the spline designs specified for various hub styles. Splines, ranging from SAE 50 to SAE 80, are produced.

This broaching operation is the most critical performed on the hub in that almost all dimensions of importance will be referred to in later operations. With one of the sockets located on a horizontal plate in the bed of the fixture, the pilot enters through the rear cross-bore. As the

pilot enters the hole in the vertical fixture plate, the part is carried against the fixture, a 1/16" float in the horizontal locator providing for automatic centering.

However, difficulties in obtaining perfect perpendicularity, as well as the slight drift which can be produced—guides have been known to spread as much as .007" in broaching this tough material—has brought under consideration the possibility of grinding the front face to perfect perpendicularity by locating from the pitch diameter of the broached spline.

FINISH MACHINING SOCKETS

Four turret lathes are set up for identical operations in finish machining the hub sockets. Setups incorporate the use of indexing fixtures for production machining on each of the sockets. Positive stops provide for ready adaptation of fixtures to three or four socket hubs. The heavy holding fixture is bolted to the headstock face plate. The part swivels on a mandrel which locates in the cross-bore, and clamps externally by a cam action. Solid buttons project against finished surfaces to assure accurate location on the combined boring, turning and facing operations.

Three-spindle profilers are employed to clean out metal at the external junction of the sockets with the barrel of the cross-bore. The part is mounted on a horizontal arbor through the cross-bore, with a socket projecting toward the machine column held firmly in a ram which is advanced into position by pneumatic action. In machining four socket hubs, the ram advances from a position at 90° to the machine spindles. When three socket hubs are machined, the plate on which the ram is mounted is dropped 30° through a radial grooved segment so that

Streamlined Production

Streamlined Production

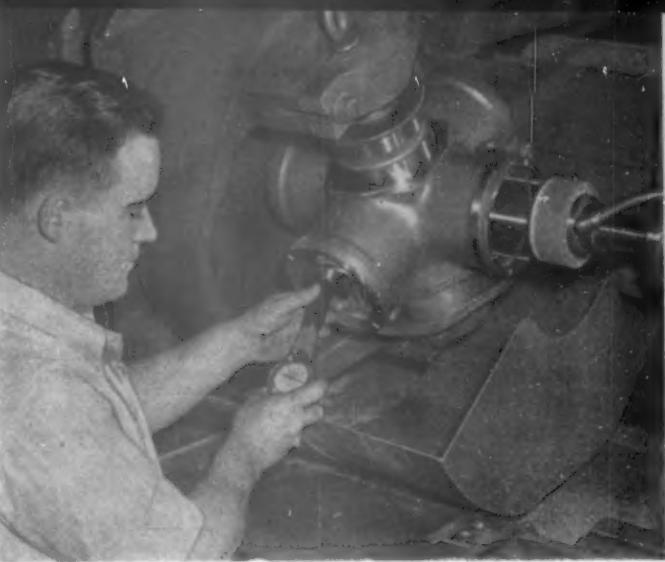
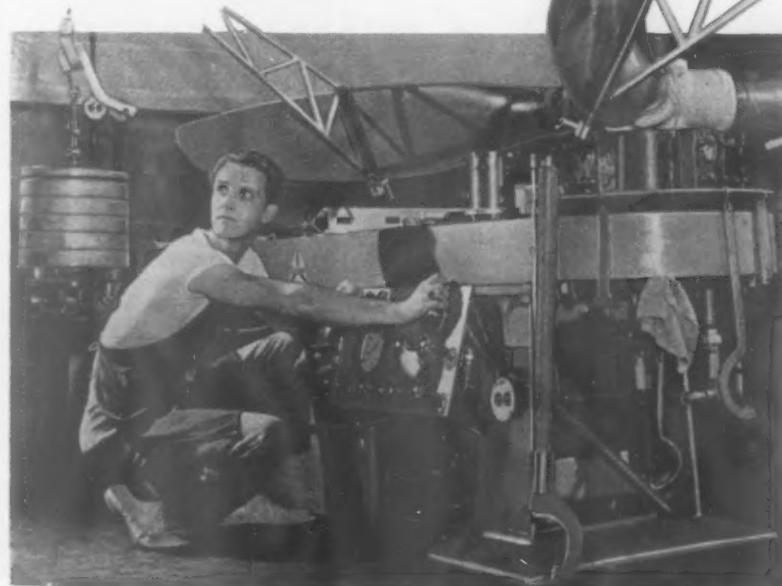
the centerline of socket around which profiling is performed is still parallel to that of the machine spindle. Parts are indexed from socket to socket to complete the entire operation in one setup. Two masters are immediately available for contact with the follower, depending upon the type of hub being machined. Follower linkage is constant, the change being effected by swiveling the proper master in position, thus maintaining the shortest practicable linkage on the follower.

A similar profiling setup is used in milling pockets in the root of the sockets. Purpose of the operation is to remove excess metal, leaving channels or ribs through which oil holes can be drilled. A specification of $1/32''$ between the centerline of the oil holes and the exterior of the ribs demands a precise operation. Oil holes are drilled at an angle with long, fast spiral drills, $.185''$. With the part located by means of a large stud over which the cross-bore sets, the hole is aligned by a jig plate which slides horizontally into position, a collar segment fitting snugly to the O. D. of the cross-bore.

Finish operations on the hub employ seven internal grinders. An indexing fixture, similar to that used on the turret lathe operations, presents each socket in turn to the grinding wheel. Location to the spline on the cross-bore assures concentricity throughout. Additional machining includes drilling and tapping holes in the front face.

Inspection is complete, incorporating hydrostatic tests

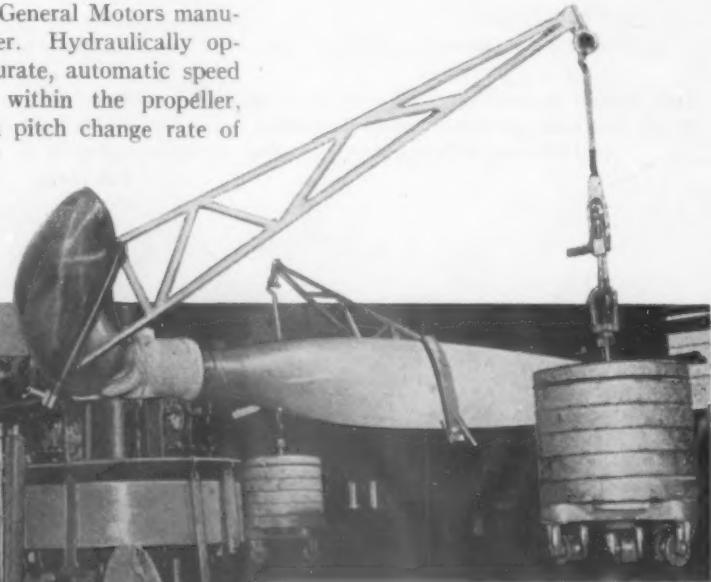
The Finished Product • Aeropropulsion Division of General Motors manufactures a self-contained, constant speed propeller. Hydraulically operated, the basic design features provide for accurate, automatic speed control. Operating fluid is contained entirely within the propeller, permitting variation for operating conditions. A pitch change rate of approximately five degrees per second is obtained. This rate is ample to maintain constant engine speed throughout the most extreme airplane maneuvers.



Internal grinder production on Aeropropulsion hub is aided by use of indexing fixture which has four stations.

which check the oil lines, magnaflux and bluing cone surfaces to check concentricity with the spline surfaces. With the part suspended vertically between the cones, height gages are used to measure dimensions. The inspection is conducted on a circular surface plate, with stop bars on the table indicating placement of the height gages for both three and four socket hubs.

Following assembly of the hub, regulator assembly, and blade, rigorous tests are imposed before delivery. These include simulation of flying conditions by suspending weights at an angle from the longitudinal axis of the blade to provide resistance to variable pitch actuation.



• Torque conditions during flying operation are simulated by suspending weights from longitudinal axis of the propeller blade. Hydraulic pitch control mechanism is tested in this manner.

This test is one of several which is performed on the finished propeller, including the blade and hub, manufactured in the plant, and several smaller components that make up the regulator, which contains the pumping and governing mechanisms.

Superfinish -- To Date

HUNDREDS of industrial concerns are finding that it is possible to produce smooth metal finishes beyond what they had previously believed commercially possible. Government specifications demanding smooth finishes in microinches have increased interest in what is meant by smooth surface finish and how it is produced. A result should be products of higher quality, giving the consumer smoother, longer operation.

Only during the past few years have we seen surface finish smoothness specified on blue prints. Engineering societies have been working for the development of a standard system of specifications, and while many tentative standards have been produced, none has been adopted as a standard. The American Standards Association, working together with various societies, has been a leader.

However, the National Aircraft Standards Committee has been working on a system also. Pending action by these groups, larger companies such as General Electric, Chrysler, General Motors, and National Cash Register, have gone ahead

M. W. PETRIE
WAR SERVICE MANAGER
OHIO UNITS

with tentative specifications. The danger is that the various large industrial concerns will spend thousands of dollars in setting up their own systems, and it will take a like expenditure to change them to conform to national standards. It is up to the standards committees to get something done, and done quickly.

The measurement of surface finish seems to be the stumbling block in setting up definite standards. There is no doubt that we have need for an instrument that will measure definitely the quality of a surface as a bearing. While progress is made in this direction, available methods must be selected as they best meet the requirements of the job at hand. The Profilometer gives a numerical rating, or an averaging of the surface irregularities, over the complete bearing surface. The Brush Analyzer gives a graphic recording of approximately .050" of surface, which is studied so that a numerical figure can be applied to the findings. Sample speci-

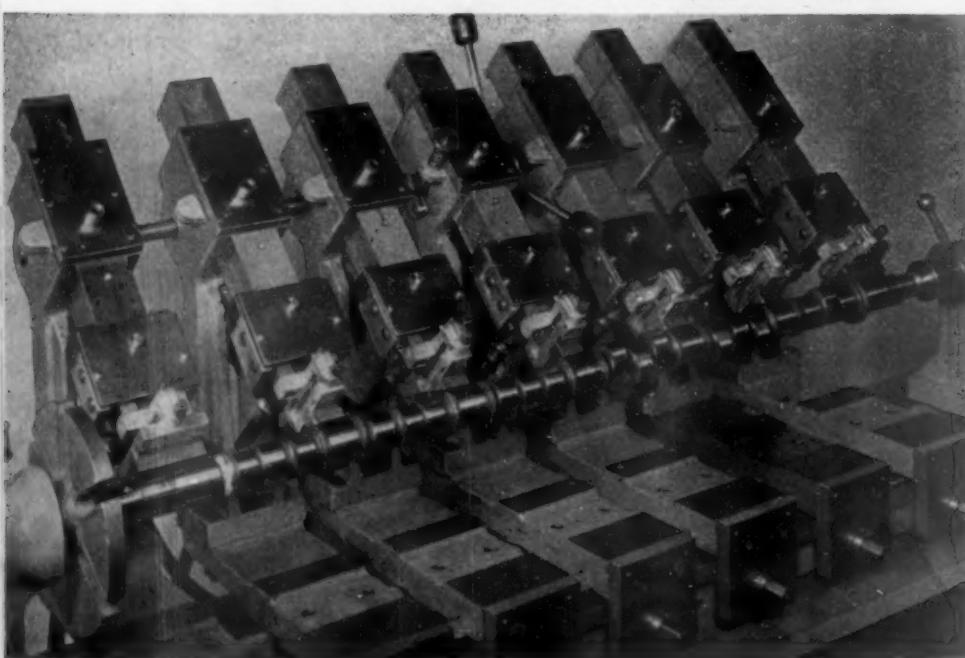
mens, to give a good visual comparison, should be made of the same type of metal being worked, since each type has its own percentage of reflectivity and will appear different to the eye, even though the finish be comparable.

Pacing interest in finish measurement standards has been the progress in finishing methods, and the broadening application of fine finishes to more and more industrial products.

Metallurgists are constantly improving steels, resulting in greater wear and strength, but in machining, the surfaces of these highly developed metals are chemically and physically changed. This is brought about through excessive localized heat caused by the various machining operations. The problem has been to remove this unwanted layer of changed surface metal that is produced by standard machining operations, and at the same time produce geometrically true and smooth surfaces. No matter how highly developed are the metals we use for bearings, they are only as good as the surface upon them.

Left, below: Superfinishing all main bearings of an automotive type engine camshaft is an application requiring high production and fine finish. Multiple station equipment meets these requirements. **Right:** Small parts, including reamers, tool bits, and milling cutters, whether of high-speed steel or carbide, are superfinished, including radii.

Ohio Units photos



Cutting tools, as well as other small parts, are added to the list of superfinished products. One result of increasing application is a growing emphasis on the need for finish measurement standards

Chrysler Corporation, with their development some years ago of the superfinishing process, proved that this could be done, and immediately set to work applying the superfinishing process to all of the important moving parts of an automobile.

At the outset of the war, there were still some exponents of rough surfaces, many of whom did not know that it was possible to commercially produce parts of a smoothness equal to or better than what we term aircraft quality today. However, as mentioned, government specifications have shown that this can be done and must be done. The advent into the industrial world of the superfinishing process has made it possible to produce commercially smaller bearings of lighter weight, adding strength to the part, allowing longer life and smoother operation.

ON HIGH-SPEED TOOLS

Another important factor in the development of manufacturing in this country has been the application of superfinish, or other methods of producing a smooth surface, to tool bits, milling cutters and reamers. In many cases, the addition of superfinishing to high-speed steel tools has allowed an increase in working speeds to nearly that of cemented carbides, plus longer life of the tool and the resultant smoother finished product. In many cases, watch parts or small instrument parts which are machined on automatics, cannot be submitted to a second finishing operation. Consequently, the original finish must be final. To meet present day specifications it has been found imperative to superfinish the tools that are used.

Recently, it has been found commercially possible and practical to superfinish carbides. The development of new type diamond bonded abrasives used with the superfinish process has made it possible to produce surfaces of much higher quality from the machining operation. Particularly is this true where using cemented carbide-tipped milling cutters for negative rake milling.

A milling operation on steel by

one of the larger aircraft companies, where a carbide-tipped fly-cutter was used, involved speeds of 1100 sfpm. This tool carried a negative rake angle of 22°. It is claimed that speeds were increased four times, feeds three times, and power input reduced 40 per cent. We are told that it is absolutely necessary that surface finish of the cutter be as near perfectly smooth as possible.

A COLD-WORKING PROCESS

Superfinishing is a mechanical method of producing smooth surfaces by cold-working the surface metal. The operation is fast, rarely requiring more than a few seconds. By cold-working, not only is a smooth surface produced, but one that is free of amorphous metal. The unwanted layer of metallurgically changed material produced through turning and grinding operations, which are termed hot-working operations, is removed, exposing the true crystals of the metal. Superfinishing is accomplished under low pressures and slow abrasive speeds so as not to create heat at the surface.

Engineers and metallurgists have long realized the advantages of cold-working, but heretofore there has been no commercial method. The fact that their theories were correct has been attested to by a large manufacturer of high pressure valves advertising that superfinishing had increased valve life 1200 per cent.

PRODUCTION INCREASES

Another example is a statement of the Sunbeam Electric Manufacturing Company: "Tests comparing a punch with a ground surface, smooth to 6 to 8 millionths of an inch, and another with a hand polished surface just as smooth, showed that the hand polished punch produced 19 times as many components before wearing undersize. A superfinished punch produced twice as many as the hand polished tool, or 38 times as many as the ground tool.

"In addition, the mirror-like surface of the superfinished tool eliminates 'crooked-heads' because the

metal flowed equally around the smooth surface of the punch. Before superfinishing, the metal being drawn would flow slower over rough spots on the punch, causing the stock to flow unequally. A reduction of 94 per cent in the cost of the finishing operations on the tools resulted."

Mr. A. M. Swigert points out in his book, "The Story of Superfinish," "the reasons for producing smoother surfaces for bearing use have been carefully analyzed. As the majority of all fine surfaces are produced for the use of lubricated bearings, the analysis of the theory and practice of lubrication is of particular interest. By carefully studying the reasons for lubricating surfaces and the theories of lubrication, the importance of producing finer surfaces will be more appreciated by laymen and technicians alike and all will have a greater appreciation of the tremendous job that lubricating oils and greases perform".

THINNER OIL FILMS

Lubricating oils have been required to be more or less universal in action. They have been required to have enough body or viscosity so that they would operate at the higher bearing loads existing between rough surfaces and yet also be light enough in body or of low viscosity so that they would adequately lubricate and prevent metal-to-metal contact between closely fitted surfaces. The smooth geometrically true surfaces as produced in the superfinishing operations are easily lubricated by the thinnest oil films.

Fine surface finish is necessary for the reduction of friction but, of equal importance, for building maximum strength into every part. It is only through extremely fine surface finish that we are able to generate the tremendous horsepower per pound of weight that is being done today. The steels and other metals being used in aircraft construction are stressed to their practical limit and it is absolutely essential that the most minute tool marks be removed, eliminating potential points of failure.

THE END

Tooling Dock Aids Jig Boring

Designed for the aircraft industry, the master tooling dock is useful in the automotive field, or wherever economical production depends upon the development of precise and coordinate tools and gages. Addition of accessories for precision boring adds to its practical possibilities

COSTS have been cut in half, time has been saved, and working facilities have been improved at Consolidated Vultee Aircraft Corporation with the adaptation of a small Master Tooling Dock unit for jobs previously accomplished on jig borers and boring mills.

The Master Tooling Dock is a three-dimensional positioning device, invented by Leland A. Bryant for the aircraft industry. Up to the present time, it has been used largely for positioning the locators on all types of assembly fixtures; but recent experiments have revealed that it can be even more valuable on some jobs when equipped with accessories which will enable it to accomplish boring operations.

The design of the Master Tooling Dock is based on the grid plane system of the master loft or body plan, and it utilizes physical members called "straightedges" to reproduce grid lines in specified locations with proper relationship to one another. There are four longitudinal straightedges in the dimension of length to represent "station lines"; two vertical straightedges in the dimension of height to represent "water lines"; and two transverse straightedges in the di-

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CONSOLIDATED VULTEE
AIRCRAFT CORPORATION

mension of width to represent "buttock lines".

The straightedges are able to represent grid lines with proper relationship to one another by means of bushed holes, which are drilled on 10.000" centers in one edge of each. The centers of these holes locate the grid lines at any point within the dimensions of the dock.

The vertical and transverse straightedges are movable, but the longitudinal straightedges are secured to the base and column members of the dock so that they are level and parallel to one another within a tolerance of plus-minus .001 inch.

"Strip templates", or location gages, are used to find intermediate locations between the grid holes of the straightedges. These are strips of cold-rolled steel with holes drilled on 10.000" centers in one margin and holes centered on the desired locations in the other margin. By means of a "T" slot and a "T" bolt, suitable fittings can be accurately positioned at any point on the longitudinal straightedges by means of a strip template. Thus the first dimension in space is

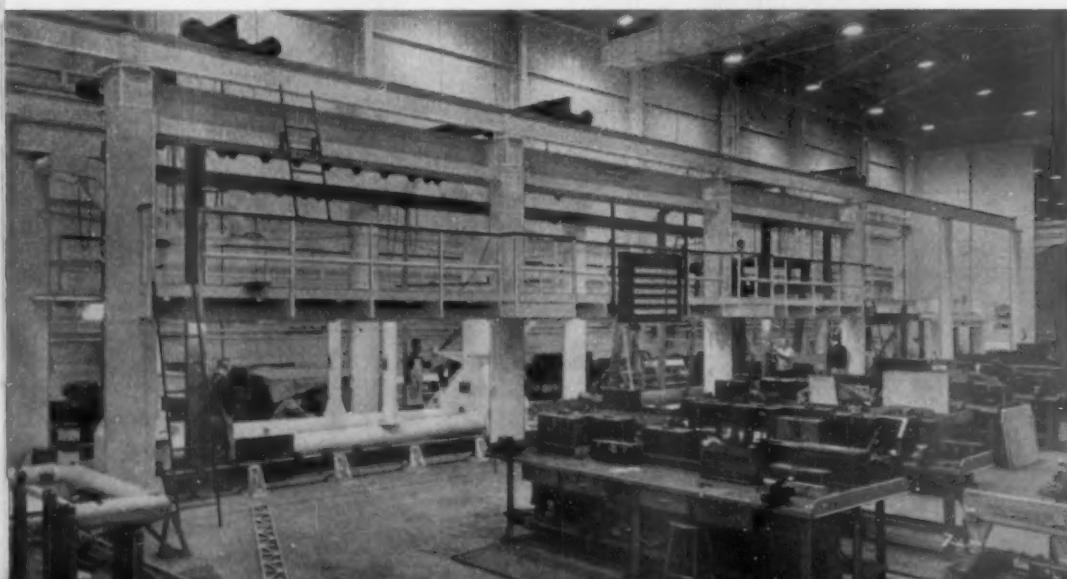
established, and the vertical straightedges may be positioned with proper relationship to the longitudinal straightedges.

The second dimension in space is found with a strip template attached to the vertical straightedges. Additional dock fittings are attached to the vertical straightedges, and on these the transverse straightedges are positioned. Either one or two transverse straightedges may be used, in accordance with the nature of the job at hand.

The third dimension in space is found by means of a strip template which positions "dummy fittings" on the transverse straightedges, and a fixture locator may be positioned directly from such fittings or from an "index template" which utilizes tooling holes to denote a series of exact locations for all stations.

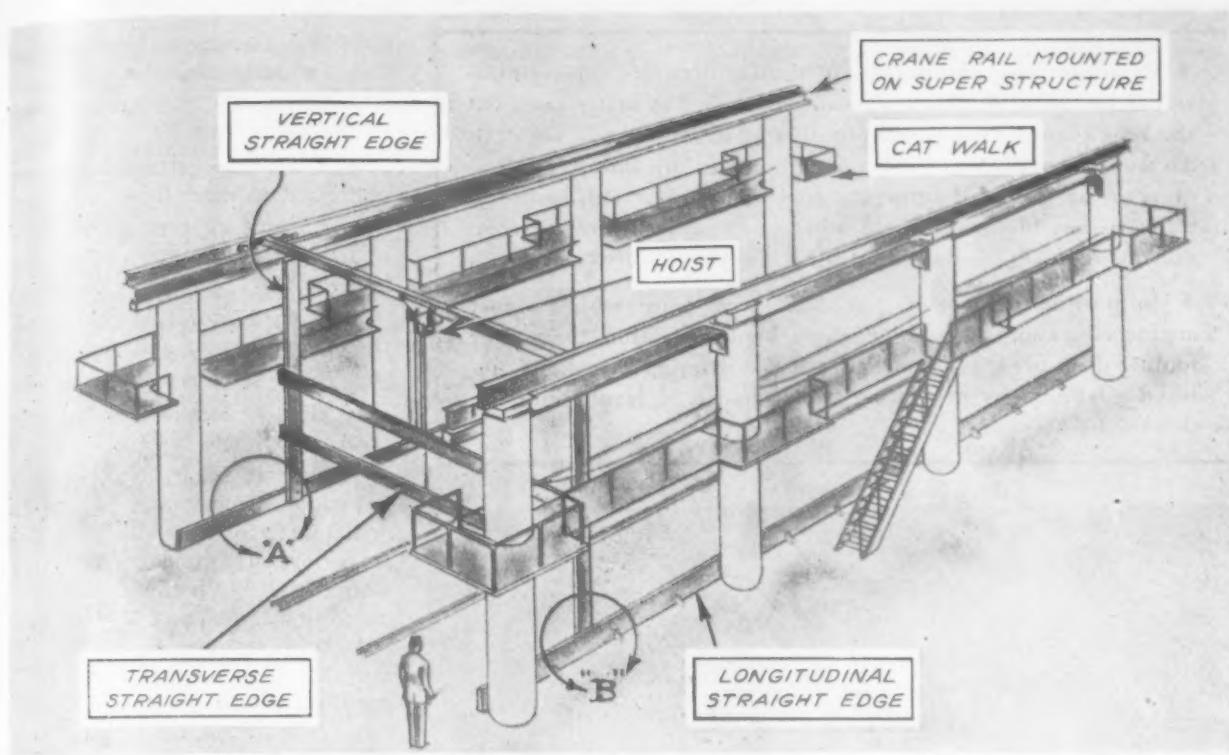
Thanks to strip templates, it is now possible to begin tooling for an airplane or automobile as soon as the basic body or station dimensions are frozen in design. These very simple accessories can be completed with utmost speed, and their entirety completes dimensional control for the finished product.

Fundamentally, the accuracy of a



Side view of Consolidated Vultee Aircraft Corporation's two master tooling dock units (placed end to end) at San Diego, California.

Consolidated Vultee photos and drawings



Except for the catwalk, the small dock unit has similar members to those shown in this drawing of important components of a large master tooling dock.

Master Tooling Dock depends upon the firmness of its foundation. For this reason, the base of the initial Consolidated Vultee dock was embedded 45 feet in the earth at San Diego; it was designed to carry a 350,000 pound load, resist soil movements caused by tide changes, and nullify vibrations due to earth tremors and nearby drophammer operations. Periodic checks have revealed that the positions of the longitudinal straightedges of this dock vary less than .001 inch in a period of three months.

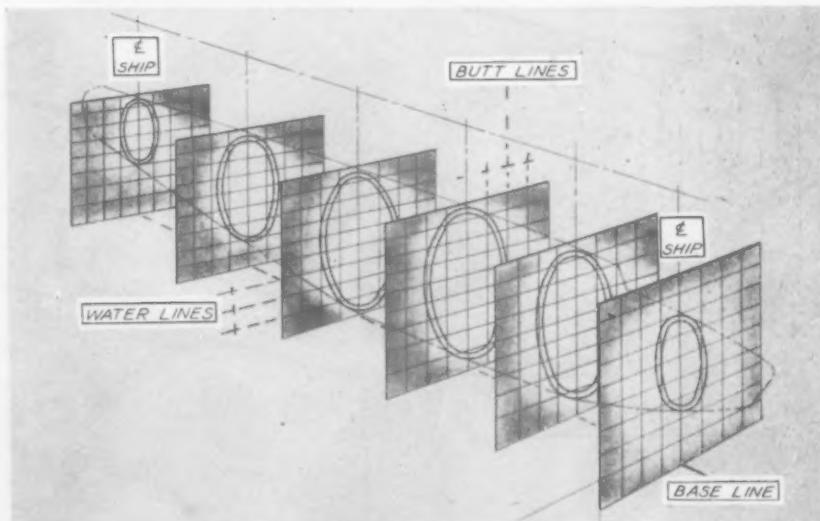
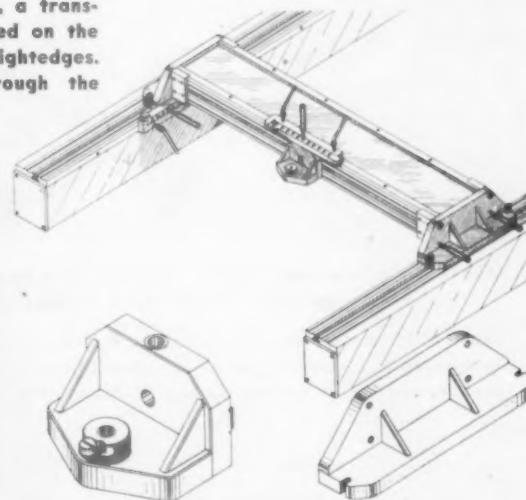
Micrometric adjusting screws make it possible to align longitudinal straightedges with precise accuracy. Trammel gages are used to position grid holes diametrically opposite one another, and the parallel relationship is verified by means of electronic leveling instruments.

Only ten simple steps are generally required to set up a fixture locator in the dock. Their sequence is:

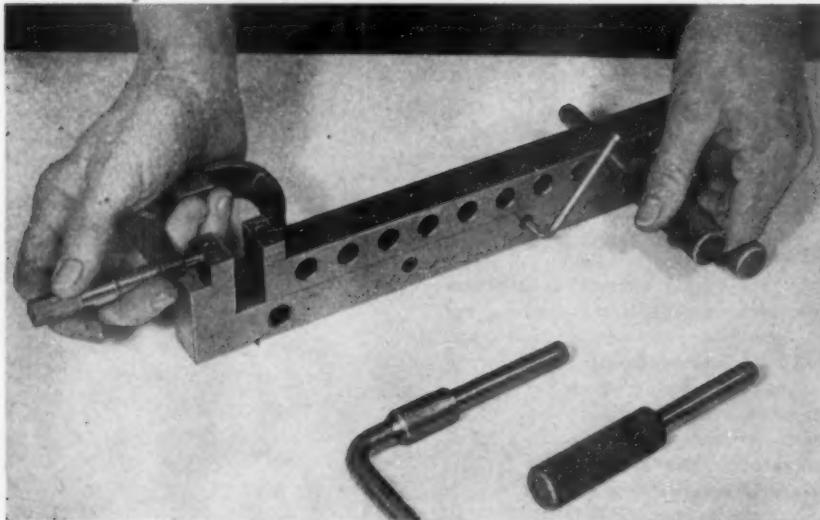
1. A fixture frame is moved into the dock by means of an overhead crane.
2. The fixture frame is positioned with proper relationship to the centerline of the dock.
3. The fixture location is toolproofed.

Right: For boring operations, a transverse straightedge is mounted on the two lower longitudinal straightedges. Boring is accomplished through the bushing of the fitting which has been accurately positioned on the transverse straightedge. An ordinary table drill may be used for the boring.

Below: Drawing indicates how bulkheads of an airplane fuselage are laid out in accordance with the lines of a grid plane system in a master loft. In the master tooling dock, these lines are represented by physical members called "straightedges."



- By simplifying the process of finding accurate three-dimensional locations, the master tooling dock has in many cases cut the time required for aircraft tooling by as much as 75 per cent. To date, the apparatus has been used only in this industry. However, the basic idea of automatic coordination warrants consideration in any industrial field where assembly of precise components requires the development of accurate fixtures and gages.
- In positioning locators, in strict accordance with product engineering and production engineering information, the master tooling dock bridges a gap between the drawing board and finished assembly, by projecting two-dimensional layout into the third dimension.



Above: On jobs where no duplicate setup is to be made, a location gage of the microbar type may be used in place of strip templates.

Below: "Strip templates" are used to find intermediate locations between grid holes in straightedges of the master tooling dock. Strip templates provide exact dimensional control in the tooling for an airplane fuselage.

4. Ship stations are positioned by means of strip templates.

5. Vertical straightedges are moved to the first station.

6. Transverse straightedges are positioned on water lines.

7. Dummy locators are mounted to the transverse straightedges on butt lines.

8. A jig locator is positioned on the dummy locator.

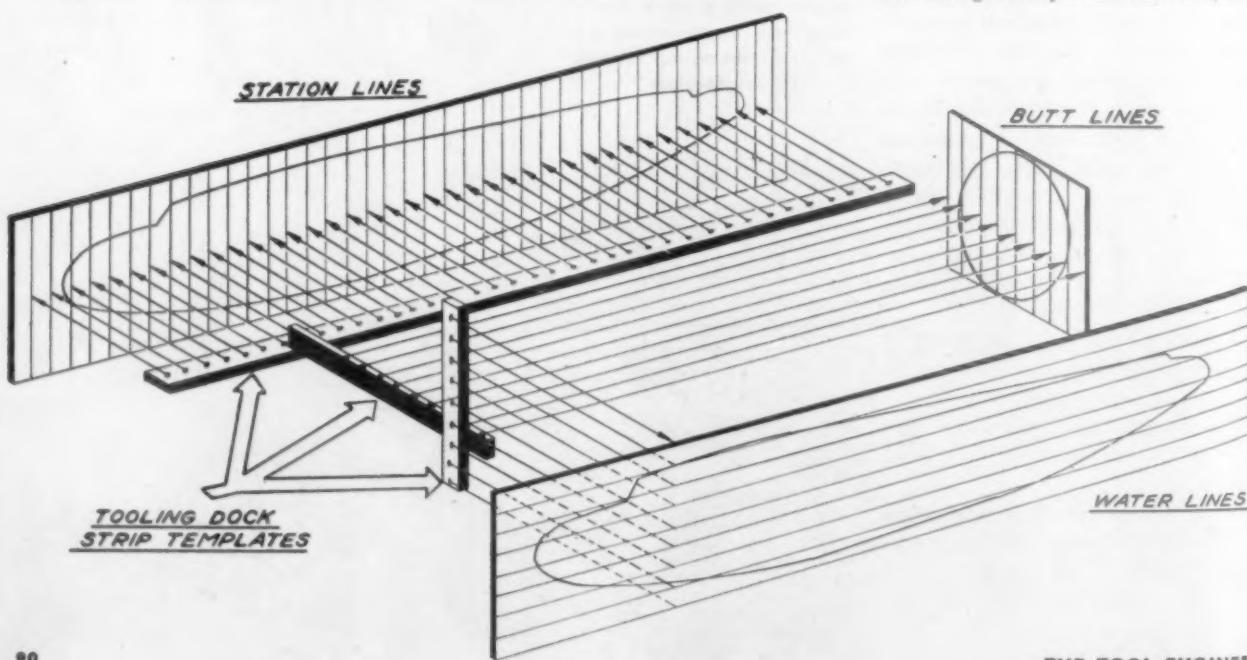
9. Entire setup is tool-proofed.

10. The jig locator is mated with the fixture frame.

The last six operations are repeated at each following station until the jig or fixture is complete. All operations are performed in rapid succession, and a large assembly fixture can be completed in a few hours by green labor.

As previously suggested, the primary advantage of the Master Tooling Dock is that it provides automatic coordination for various three-dimensional assembly fixtures with accuracy and reliability that was heretofore possible only in positioning second-dimensional detail assembly fixtures.

Three-dimensional assembly fixtures can now be positioned without recourse to freehand measurements on the part of toolmakers, and with such rapidity and economy as to justify even the construction of prototype airplanes on the basis of an efficient manufacturing breakdown. Strict conformity with lofting data facilitates the establishment of parts interchangeability from the start, and



Holes, "T" slots, and suitable fittings enable workmen to locate the movable transverse and vertical straightedges with proper relationship to the fixed longitudinal straightedges in the master tooling dock.

many months can be saved in initiating the production program for any large structure.

Therefore, in maintaining three-dimensional machine-shop tolerances, the Master Tooling Dock was from the start analogous to the jig borer and boring mill. However, accessories which enable it to serve these functions were developed only recently.

When used as a jig borer or boring mill, the Master Tooling Dock is first equipped with brackets and supporting rails which hold the work in a suitable horizontal plane. Then a transverse straightedge is equipped with special end fittings, which enable it to be mounted and moved fore and aft on the lower longitudinal straightedges.

The position of the hole to be bored is located by a bushing in a special dummy fitting, which is positioned on the transverse straightedge by means of a location gage or strip template. The boring operation is accomplished by inserting the boring tool through the bushed fitting. An ordinary table drill may be used.

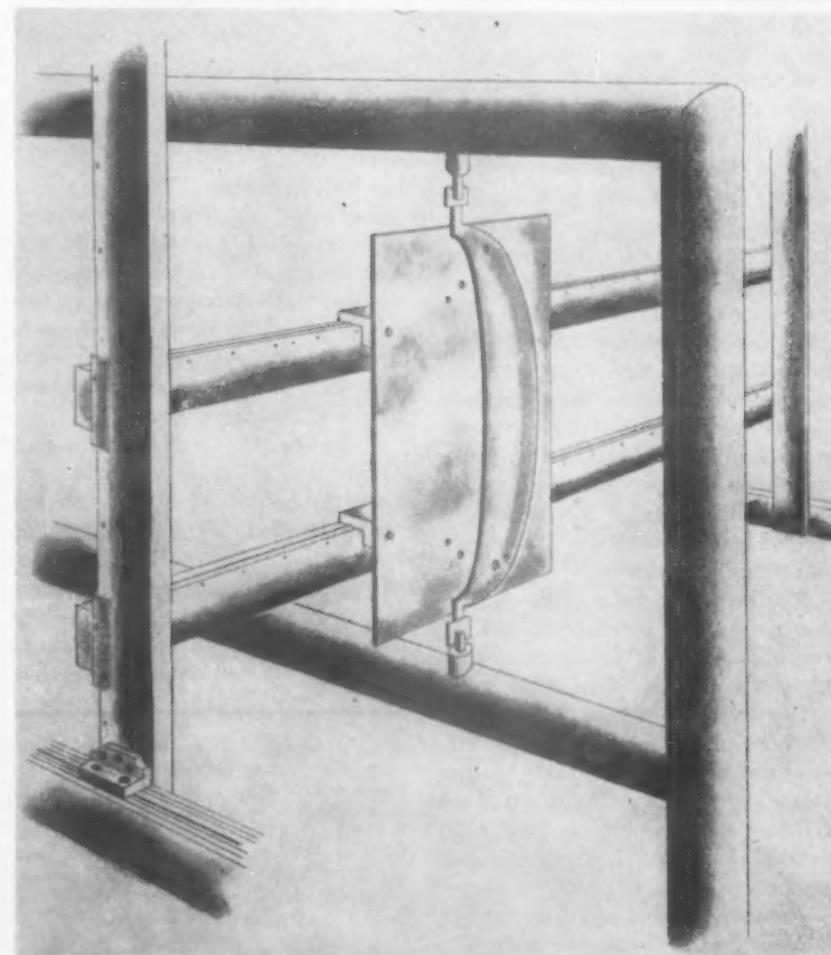
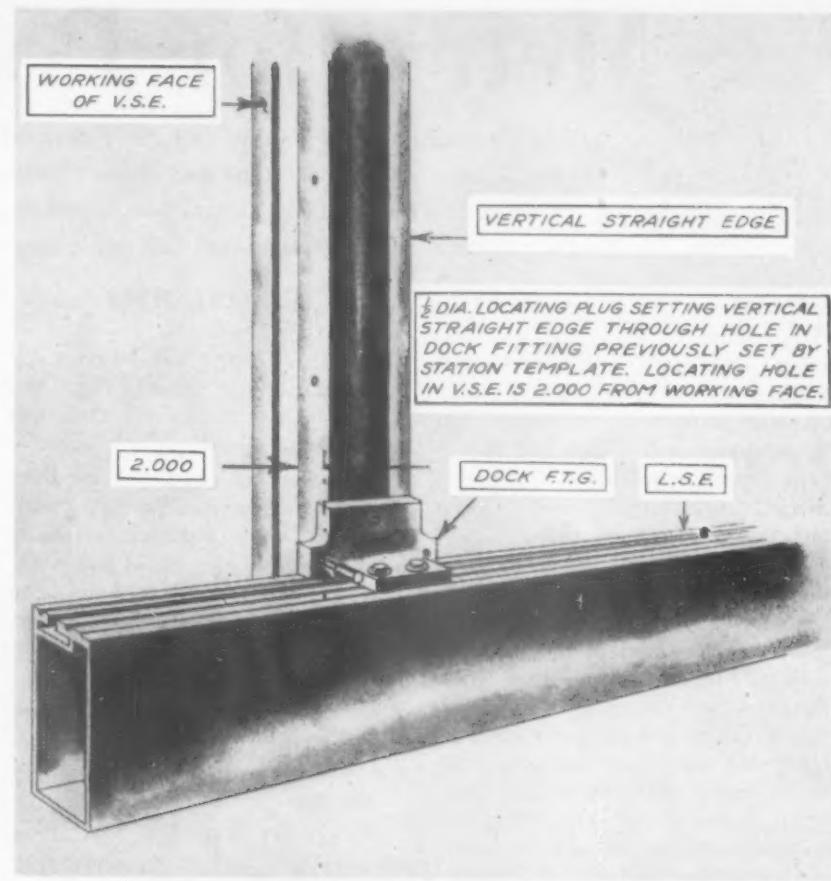
COMPARISON OF COSTS

A large boring mill with working limits of 60" x 60" would cost approximately \$30,000, and a jig borer with limits of 20" x 50" would cost more than \$20,000. A small Master Tooling Dock capable of handling precision layouts up to 70" x 240" in less than half the time required by either a jig borer or boring mill, costs less than a jig borer and is capable of universal application in a tooling program when equipped with only a few hundred dollars' worth of accessories.

Although it was developed for the aircraft industry, the Master Tooling Dock can be advantageously utilized by any manufacturer whose production depends on the development of precise and coordinate tools and gages.

THE END

An "index template" may be used in the master tooling dock to find three-dimensional locations in rapid succession by means of tooling holes.



Metric for Postwar

Would you exchange our dollars and cents decimal monetary system for the English pounds, shillings and pence? Why not? When you have answered these questions, you have gone 90% toward abolishing our other measuring standards and accepting the metric system

UNTIL RECENTLY, espousing the metric system has been tantamount to bashing ones head against a stone wall. Better, perhaps, to let the wall stand until it crumbles—as it eventually will. The cold fact is that America has been buying the metric system over a period of years on a costly installment plan.

Main barriers to conversion have been prejudice and the allegedly huge costs.

Actually the cost seems nominal in view of the benefits. With a world reconstruction program looming on the industrial horizon, favorable consideration toward all out conversion to the metric system is not only timely but economically sound. Whatever the investment to American industry, we would earn tremendous interest.

Before going into that, however, let us consider some of the pet arguments in favor of the American system. One is: "The rest of the nations will buy American goods regardless of system. Look at the way they've bought during this war."

That is just smug complacency, if not sheer arrogance. The world has been buying American manufactured goods for various reasons. For one thing, we have become the most highly industrialized nation on earth.

The cold truth is that our huge exports of machine tools and other equipment have largely been because our Allies couldn't produce in demolished factories. Yet, when the tide of battle turned—well, just consider the industrial strides in Russia.

Another argument: "We use the same system as the British, and between us we'll probably dominate the postwar industrial world."

Our system (also known as the English) and the British are only superficially alike, as makers of precision gage blocks will attest. How can we hope for American-British industrial dominance when the standards are entirely different.

Actually, we are measurement isolationists, at variance not only with

A. E. RYLANDER

the world at large but with our immediate neighbors to north and south. Except for money, Canada subscribes to the British system.

In laying the comparatively short stretch of the pan-American road through Central America, manhours were soaked up because of a dual system of measurement. And Latin America will not relinquish the metric.

And now, the favorite of the stand-patters: "Why change from the American system, when we're all used to it?" Are we? Let any reader put the following questions to a score of acquaintances.

How many feet in a mile? How many square feet in an acre? How many quarts in a peck? How many grains in a drachm, and how many drachms in an ounce?

The percentage of correct answers are likely to be surprisingly low, besides which the questioner may need a reference table.

Consider the basic arithmetic of tool design. We're used to it, eh? Yet, even the staunchest exponent of the American system must admit that conversion of fractional dimensions to decimal equivalents—and vice versa—is time consuming and conducive to errors. Ask the checker.

True, the 64 divisions of the inch resolve into ultimate zero, and some know these by heart, but, we are less fortunate when it comes to 3rds, 6ths, 7ths and 12ths—or duodecimals. These fractions occur rather frequently in gear calculation, and, unless the designer has them definitely in mind because of constant repetition, they

must be converted on each occasion.

Nor are the results exact in view of modern precision standards of manufacture. By contrast, the users of metric have long since been one up on us. When we were haggling over the split thousandths, they were working to 1/100th of a millimeter, or about 4/10 finer than our ultimate at that time.

A cursory glance at the accompanying tables comparing American and metric systems shows the utter simplicity of the metric system. There are only six tables as compared to the American ten, and each is definitely related to the other. Besides, any of them can be reconciled with our decimal dollar or its fractions, whereas not one American unit can be so reconciled unless it is first converted to decimals.

Now, carrying the metric system to its ultimate, we have the absolute C. G. S. (centimeter—gram-second) system, which is based on length and weight, and on one second as the time unit. In other words, distance is 1 centimeter; weight, 1 gram, and time, 1 second. These units resolve into:

1 centimeter in 1 second=unit of velocity, with mean acceleration due to gravity as 981 centimeters per second.

1 dyne (or 1/981 gram)=unit of force.

1 erg, (or 1 dyne-centimeter)=unit of work.

1 watt (or 10,000,000 ergs per second)=unit of power.

This system is standard for electrical apparatus, except that the joule (10,000,000 ergs) is largely used instead of the erg itself.

While, in the strict sense of the word, there is no direct connection between heat and the two systems discussed, it may be a timely reminder that the centigrade—or Celsius—thermometer is also based on decimals. That is, freezing point is zero, while boiling point is 100°.

Rapid development in induction heating, super-cooling, and electronic control for both heat and motion encourage obsolescence of the Fahrenheit thermometer in favor of the centi-

- Two adherents of the American standard of measurement will present their views on conversion to metric system in next month's issue. • These men are: Mr. Arthur Merry, Chief Tool Engineer, Pratt & Whitney Aircraft Division, and Mr. Frederick L. Woodcock, Hamilton Standard Propeller Division, United Aircraft Corporation.

grade, providing an all-out decimal system.

With the object of simplifying The American System, there has been resort to compromises which are mere palliatives. Various manufacturers have obsoleted fractional dimensions in favor of decimal. As, for example, expressing $5/16$ as .31 and $3/8$ as .37 or .38, and so on. There is also an inclination toward superseding the 12" foot with a 10", thereby reconciling inch-foot decimal fractions.

Further, there is a sharp trend toward the use of 1/10th hours, and fractions thereof, instead of the conventional divisions. Industrial stopwatches have long since been calibrated in 100ths. In this connection, a proposed 20 hour clock would further facilitate computation.

With the exception of money, then we are deviating sharply in practice from a system to which we tenaciously cling by lip service.

Some industries are going all-out for metric. Some are vacillating between the two systems, and still others seem bent on evolving an American "metric" or decimal system which, though simpler, would still leave us measurement isolationists. Well, then, since we are going metric on the installment plan, the logical conclusion is that we adopt it in toto.

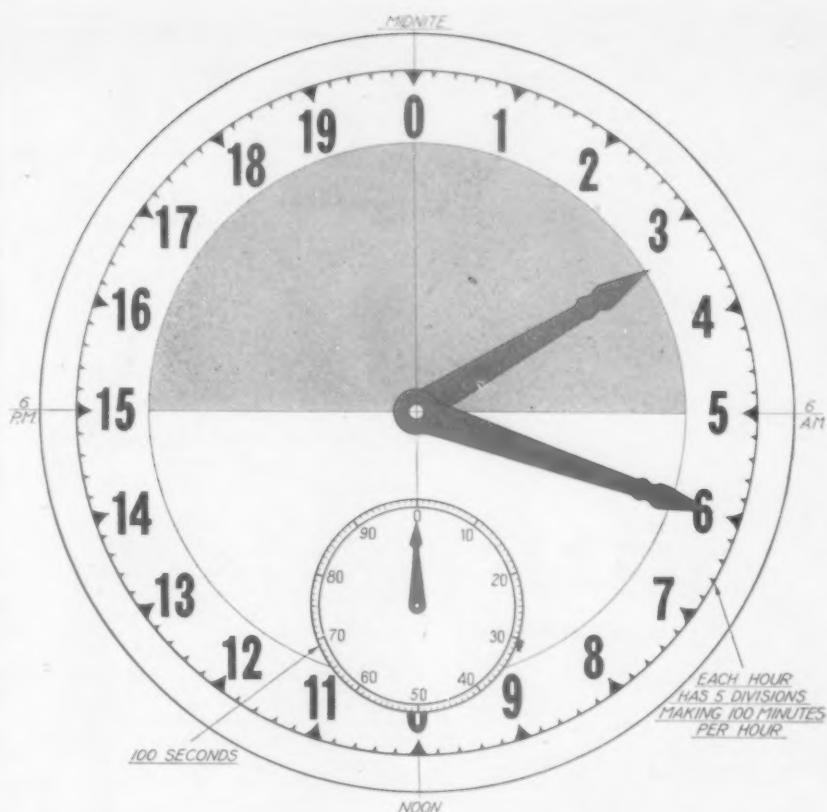
EVOLUTIONARY CONVERSION

Now, concerning costs, conversion would be nowhere near as revolutionary as many contend. About the only changes necessary, at the outset, would be in our way of thinking.

Many industries would be superficially affected. The woodworking industry, as well as the makers of woodworking machinery and tools, would suffer no immediate transition. A 30" by 60" table or desk would merely be termed an 8 by 16 decimeter (near enough) or, more exactly 76 by 152.5 centimeters. In inches, that would be 29.92" by 60.04", near enough to ordinary woodworking tolerances.

In the building trades, a 24' by 40' dwelling would be called 7 by 12 meters (also near enough) while dimension lumber would be expressed in metric—i.e., a 2 by 4 would become 5 by 10 decimeters.

Six, 8, 10, 12 and 15 inch I-beams, for instance, would be expressed as 152, 203, 254, 305 and 380 millimeters, respectively. Present dies,



TIME SAVED by adoption of the metric system will be a big factor in paying the cost of conversion. Further, the author suggests saving time on time itself by means of a metric clock.

for structural shapes, could be used until worn out, when replacements would be metric. For sheet stocks, one would adjust the rolls.

In the automotive industry and allied fields, there need be no abrupt transition, just progressive evolution starting with a change in nomenclature of measurement.

The popular 600 by 16 tire would become 152.4 by 406.4 mm (using the Johansson 25.4 conversion standard) and, if we later wanted to use even figures—as 152 x 406 mm—the actual dimensions, in inches, would be 5.984 by 15.984, or only 1/64" under present nominal dimensions—close to tolerance limits.

A frame, now 50" at its widest point, would become 127 cm, and if of .120 stock, the gauge would be 3 mm. near enough. Tolerance for frames and bodies is rather broad, often as not plus or minus 1/32". There is no intent here, of course, to establish arbitrary dimensions but these figures serve for comparison.

Immediate postwar automobiles might be '42 models, yet for educational purposes, dimensions could be expressed easily in metric. For that

matter, the American system could be retained pro tem, although the sooner we begin thinking in metric the easier will be its use on new models.

An engine of 3.5" bore by 4" stroke would become 88 by 102 mm, near enough, and its cubic displacement would be stated in liters instead of inches. Cast, as well as pressed steel dimensions could be maintained until change of design, and the same holds true for accessories. Spark plugs are already made in both American and metric, which would mean obsoleting one and concentrating on the other.

When it comes to axles and transmissions, sheer logic indicates conversion. Right now, transmission and axle shafts are made to dual standards—American for overall diameters and lengths, and metric for ball bearing installations. The same holds true for cases and housings.

For example, a shaft with a nominal O. D. of 1 1/2" may have a bearing diameter of 1.1811", or 30 mm. 1 1/2" converts to 38.10 mm which, if stated as even 38 mm, would be 1.496" or within the ordinary limits of tolerance.

Almost any modern machine tool

THE AMERICAN SYSTEM • For brevity, inches are designated as in. or ", and yards as yd.

LINEAR

12"	1 ft.
36"	3 ft. 1 yd.
5280'	1760 yds. 1 mile
Also used:	
1 hand	4"
1 span	9"
1 fathom	6' 2 yds.
1 rod	16.5 ft. 5.5 yds.

SQUARE

144 sq. in.	1 sq. ft.
9 sq. ft.	1 sq. yd.
30.25 sq. yds.	1 sq. rod 625 sq. links
484 sq. yds.	16 sq. rods 1 sq. chain
10 sq. chains	43,560 sq. ft. 4840 sq. yds.
1 acre	
6400 sq. chains	640 acres 1 sq. mile

SURVEYORS'

7.92"	1 link
100 links	1 chain 66 ft. 4 rods
10 chains	220 yds. 1 furlong
80 chains	8 furlongs 1 mile

CUBIC

1728 cu. in.	1 cu. ft.
27 cu. ft.	1 cu. yd.
1 cord (wood)	128 cu. ft.
1 perch (masonry)	24 1/4 cu. ft.

can reproduce its kind, or part of its kind, just as easily in metric as in American. For screw cutting, of course, lead screws and gears would have to be modified. However, many lathes are already built to cut either American or metric threads. On universal mills, lead screws and gears would require modification, as would index trains on automatic gear cutters.

Present planers, production mills, drills, boring mills, chucking machines and turrets in general could be used until worn out. Since future machines would be improvements over present models, with consequent engineering, the first cost of conversion, if any, wouldn't be much greater than if the American system were retained.

Since it is not unusual to rework existing patterns for new models of machines, these could be retained without materially affecting metric measurements. A lathe bed of 12" by 15" cross section would be termed 305 by 380 mm, or, if you prefer 3.05 by 3.8 dm. (All you do is transpose decimals. Try it in American).

The one industry that would be most profoundly affected by conversion

DRY	
2 cups	1 pint
2 pts.	1 quart
8 qts.	1 peck
4 pkts.	1 bushel 2150.42 cu. in. 1.2445 cu. ft.

Heaped bushel	1 1/4 X std. bu.
(For comparison, British bushel	2218.19 cu. in.)

LIQUID	
4 gills	1 pint
2 pts.	1 quart
4 qts.	1 gallon 231 cu. in.
(For comparison, British gallon	277.27 cu. in.)

APOTHECARIES' FLUID MEASURE	
60 minimis	1 fluid drachm
8 drachms	1 fl. ounce 1.805 cu. in. or 1/128 gal.

AVOIRDUPOIS WEIGHT	
437.5 grains	16 drachms 1 ounce
7000 grains	16 ounces 1 pound
2000 lbs.	1 short (or net) ton
2240 lbs.	1 long (or gross) ton

TROY WEIGHT (for gold, silver)	
1 grain Troy	(same as avoir. and apoth. wgt.)
24 grains	1 pennyweight
480 grains	20 pennyweights 1 (Troy) ounce
5760 grains	12 ounces 1 Troy pound

APOTHECARIES' WEIGHT	
20 grains	1 scruple
60 grains	3 scruples 1 drachm
480 grains	8 drachms 1 ounce
5760 grains	12 ounces 1 pound

THE METRIC SYSTEM • For comparison, 1 millimeter = .03937 inch. And since, in measurement, the millimeter is usually divided into hundredths, 1/100 mm = .0003937". For purpose of conversion, as metric to inches and vice versa, Johansson's 25.4 is the accepted standard of conversion.

LINEAR

10 millimeters (mm)	1 centimeter (cm)
10 centimeters	1 decimeter (dm)
10 decimeters	1 meter (m)
1000 meters	1 kilometer (km)

SQUARE

100 sq. mm (mm ²)	1 sq. cm. (cm ²)
100 sq. cm	1 sq. dm (dm ²)
100 sq. dm	1 sq. meter (m ²)

SURVEYORS' SQUARE MEASURE

100 sq. meters (m ²)	1 are (ar)
100 are	1 hectare (ha)
100 hectare	1 sq. Km (km ²)

CUBIC MEASURE

1000 cu. mm (mm ³)	1 cu. cm (cm ³)
1000 cu. cm	1 cu. dm (dm ³)
1000 cu. dm	1 cu. meter (m ³)

DRY AND LIQUID MEASURE

10 milliliters (ml)	1 centiliter (cl)
10 cl	1 deciliter (dl)
10 dl	1 liter (l)

100 liters 1 hectoliter (hl)
(1 liter = 1 cubic decimeter = volume of 1 kilogram of pure water at 4 degrees centigrade (or Celsius) or 39.2 degrees F.)

MEASURES OF WEIGHT

10 milligrams (mg)	1 centigram (cg)
10 cg	1 decigram (dg)
10 dg	1 gram (g)
10 grams	1 decagram (Dg)
10 Dg	1 hectogram (Hg)
10 Hg	1 Kilogram (Kg)
1000 Kg	1 metric ton (T)

would be small tools manufacture. Yet small tools are perishable, and the industry lives on replacement. The immediate cost would fall on the users of steel rules, micrometer and vernier calipers and other precision measuring tools which would have to be replaced with metric.

Naturally, the burden would fall on workers and employers alike. And, while the average cost to the craftsman might be confined to around \$25.00, average, the cost to the employer would be indisputably higher. Plug and ring gages, precision gage blocks and many cutting tools—such as drills, taps, and milling cutters would have to be replaced.

Except for form tools and cutters, however, the average cutting tool loses its original dimension on first grinding, and most of the drills could be used until worn out, either as roughing or reamer drills. Reamers could be resized to metric, as could plug and ring gages. They have to be resized anyway, as they wear.

Any manufacturer, taking on a job set up to metric, would not hesitate to purchase the necessary metric

gages. Why then, oppose a conversion to metric, when the results are the same except that the new system would prevail?

We may face a general if transitory period of unemployment. With millions of soldiers returned to civilian life, and whom the employers are pledged to reinstate, what price their reemployment if there is no work for them to do?

We can insure almost immediate postwar mass employment by adoption of the metric system, but, what is more to the point, we can go far toward insuring continued American industrial leadership by conversion. The markets that we want to reestablish, and even new markets that we want to enter, are practically all established on the metric system.

True, we can stand pat and stick to our cumbersome,—archaic system, and make our customers like it. They'll probably buy—at first. But in the long run, competitors who manufacture to metric will have an advantage, just as Germany and Sweden had an edge on us in South America before the war.

THE END

The ABC's of Turret Lathe Tooling

HOW TO Machine Parts on Turret Lathes

TOOLING GUIDE BOOK

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The Operators' Service Bureau
THE WARNER & SWASEY CO.
Cleveland 3, Ohio

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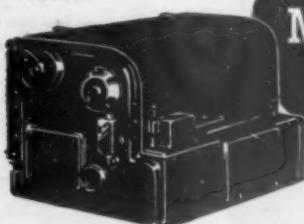
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different part . . . any size, any shape within the machine's limits.

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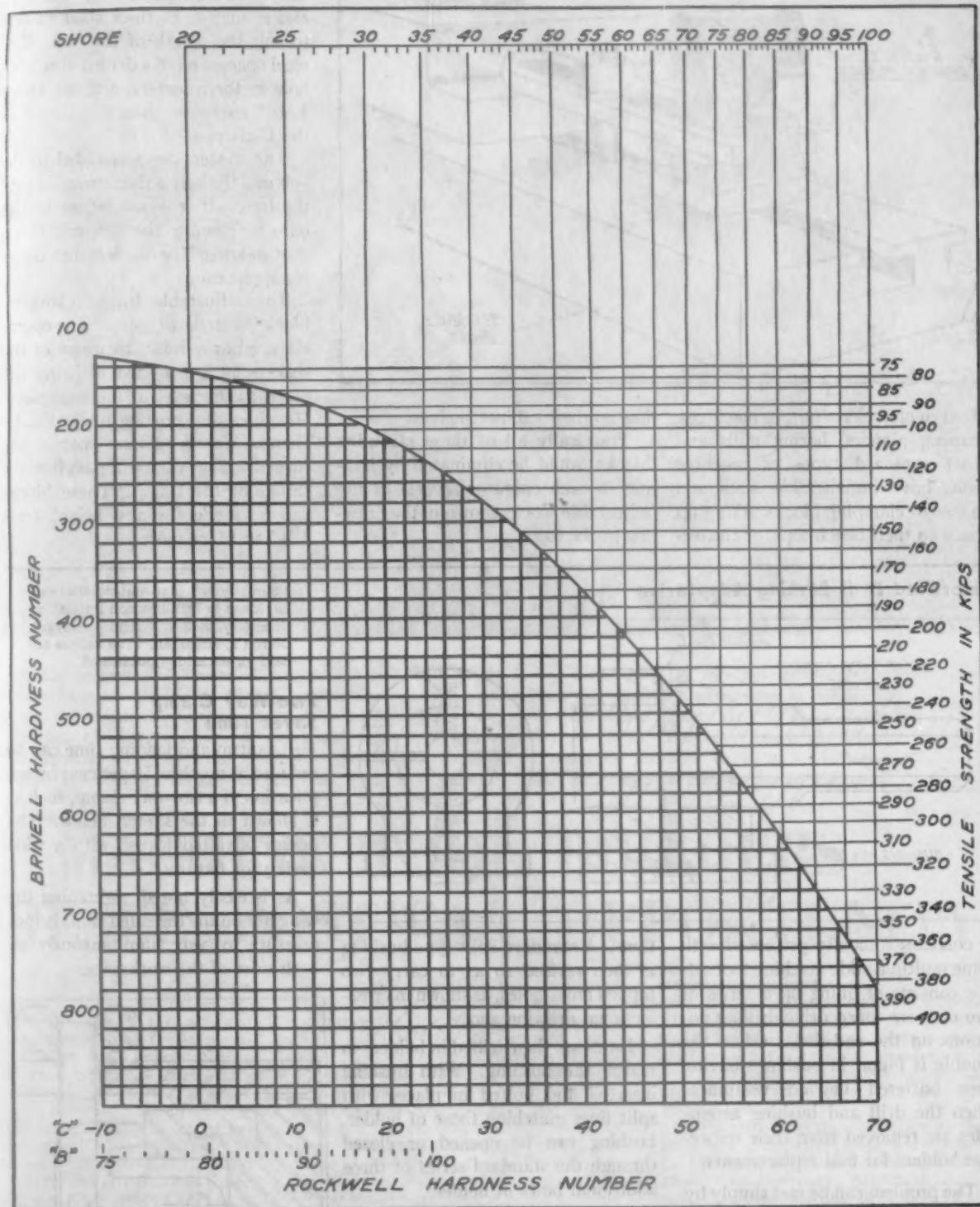
THE TOOL ENGINEER

PRODUCTION DATA SHEET

HARDNESS CONVERSION CHART

COMPILED BY CHARLES E. MILES

McQUAY-NORRIS MANUFACTURING COMPANY



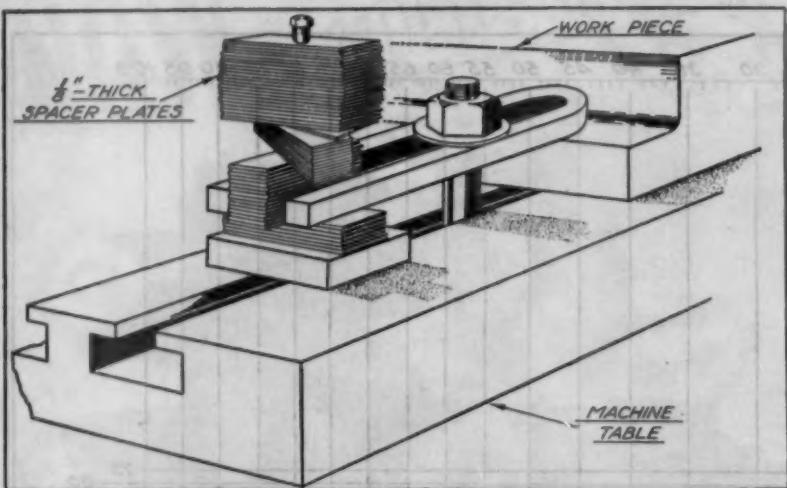
NOTE: This is the thirty-seventh of a series of Data Sheets to be published in THE TOOL ENGINEER.
A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

THE TOOL ENGINEER FOR NOVEMBER 1944

THE CRIB

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY
IDEAS - KINKS - SHORT CUTS

Adjustable Height Clamping Block for Standard Operations



MOST OPERATORS of milling machines, shapers, planers, boring mills and other standard types of machine tools, have innumerable sizes and shapes of clamping blocks taking up space on their bench tops, or clutter-

ing up their cabinet shelves.

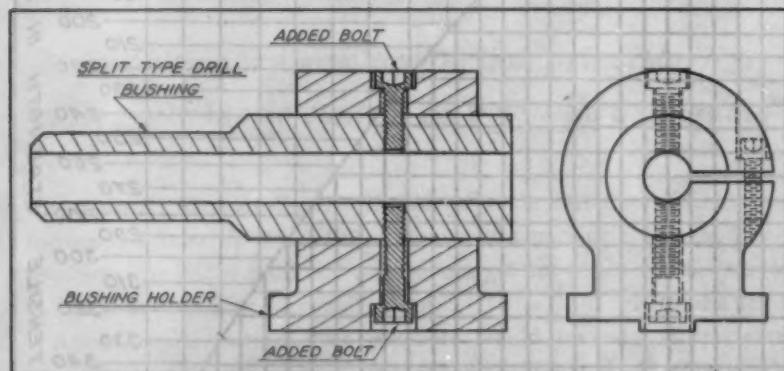
Practically all of these clamping blocks would be eliminated by issuing to each operator several of the adjustable blocks shown in the drawing at the top.

Each of the blocks consists of a flat steel base with a tapped hole through its center, a long thin bolt, and enough 1/8" thick steel spacers to suit the length of the bolt. The steel spacers have a drilled clearance hole in their centers, and are about 1/16" narrower than the throat of the U-clamps.

The spacers are assembled to the bolt and the bolt is then threaded into the base. It is made secure to the base by peening the end over or by spot welding. The block is then ready for application.

The adjustable height clamping block is simple to apply. The operator need only select as many of the spacers as are needed to bring the block to the level of the workpiece. He slides that portion under the U-clamp. The remaining spacers are turned so that they will pass into the throat of the clamp. These blocks can be made for any height from 3/4" to 8" or more.

Improved Drill Bushing Adaptation



A COMMON difficulty presented with some multiple-slide machine tool set-ups consists of lining up a series of two or more consecutive drilling positions on the end-slide. Often the trouble is found in bushings having been battered beyond usefulness when the drill and bushing assemblies are removed from their respective holders for tool replacements.

The problem can be met simply by beginning with drill holders which have been accurately bored in each of their respective end-slide posi-

tions. A standard split type bushing is then revised so as to carry two tapped cross-holes, as shown in cross-sectional drawing above.

Holes are then drilled in holders to match the bushing. With bushing inserted and bolted in place, with split lines matching those of holder, bushing can be opened or closed through the standard series of three additional bolts in holder.

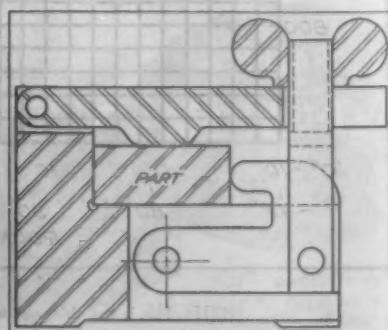
Sufficient expansion of the bushing can be obtained to remove tools by hand and not damage bushing.

Send your time-and-material-saving ideas to The Bramson Publishing Company, 2842 W. Grand Boulevard, Detroit 2, Michigan. Five dollars are paid for each idea published.

Two-Way Clamp Saves Time

UNLOADING and loading time can be reduced as much as 50 per cent by application of a two-way clamp, such as is shown in the sketch below. The design is suited to use with a wide variety of fixtures.

As is easily noted, tightening the wing nut on the threaded shaft brings pressure to bear simultaneously on both sides of the workpiece.



MEN • MATERIALS • MACHINES



In the seventh of a series of nation-wide PRODUCTION Round-Tables held by this publication, executives from six Rockford, Illinois, machine tool builders considered the postwar requirements in metal-cutting equipment suggested by users who participated in earlier Round-Tables. Seated, left to right: L. H. Geddes, Greenlee Brothers & Company; Albert M. Johnson, Barnes Drill Company; Hugo L. Olson, Sundstrand Machine Tool Company. Standing, left to right: George O. Johnson, W. F. & John Barnes Company; H. B. Newton, Rockford Machine Tool Company; and H. F. Collins, Barber-Colman Company.

MACHINE TOOL BUILDERS FORESEE POSTWAR OPPORTUNITY

A CHALLENGE to produce new machines designed to further reduce production costs in the postwar era will be welcomed by American machine tool builders as an opportunity to fulfill what they believe is their duty and responsibility to the metal-working trade.

That, concisely, is the opinion of executives representing six machine tool manufacturers participating in the most recent PRODUCTION Round-Table. This forum-meeting, held October 4, in Rockford, Illinois, was designed to crystallize the reaction of prominent individual machine tool producers to certain postwar machine tool design

requirements visualized by users who are readers of this publication.

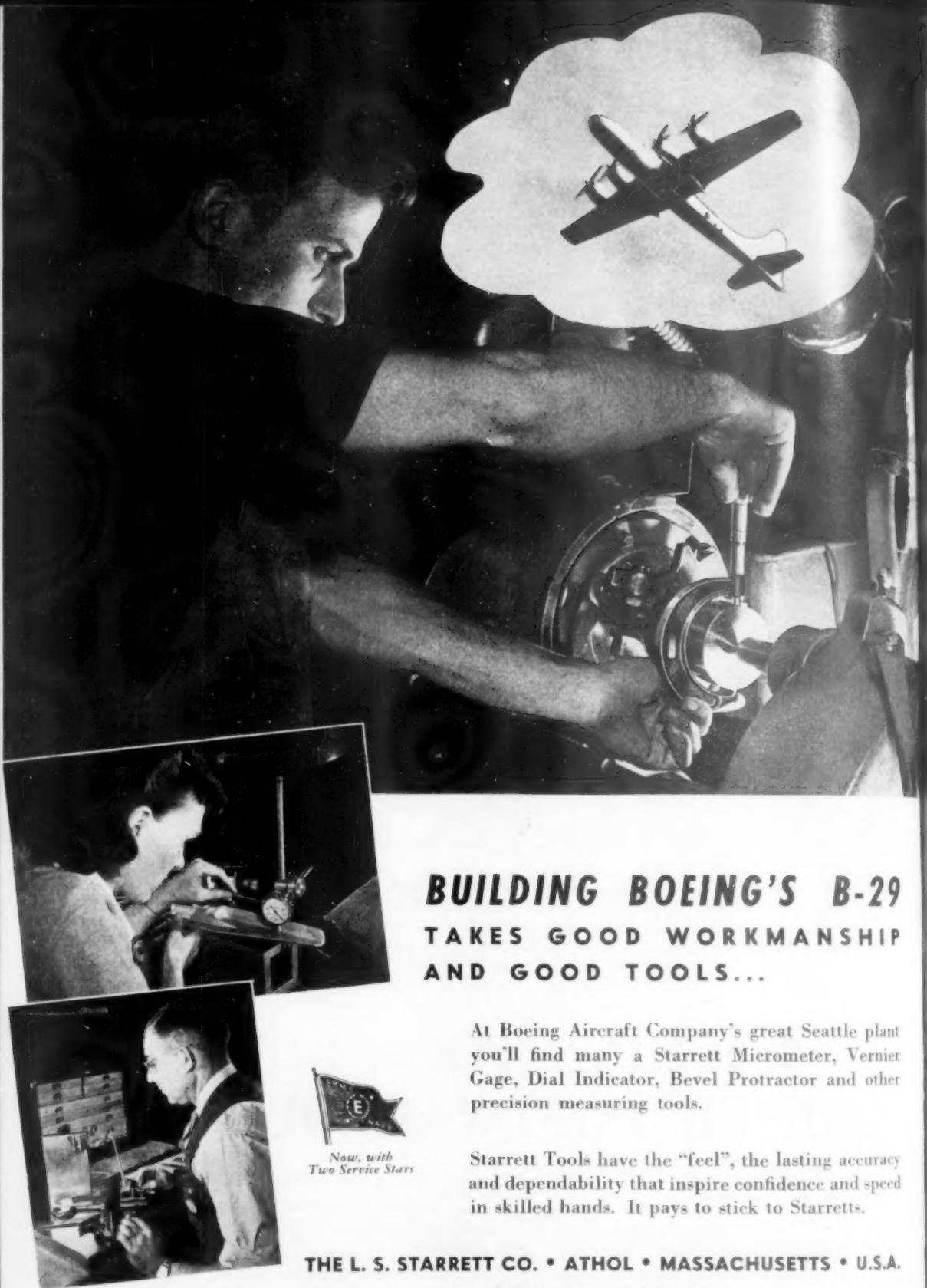
During the six months preceding this PRODUCTION Round-Table with representative members of the metal-working industry, the editors of this magazine travelled from coast to coast to hold Round-Table discussions with the largest machine tool users in important manufacturing centers. At these meetings, and through the PRODUCTION POLL of the more than 20,000 readers of this magazine, these editors have gathered comprehensive reports on postwar machine tool requirements as foreseen by production engineers in widely diversified mass

manufacturing industries.

In this seventh meeting in the nation-wide series, the builders of machine tools were invited to express their opinions on the postwar requirements and trends in metal-working equipment suggested by users at previous Round-Tables.

Participating in the discussion at the Rockford University Club were Hugo L. Olson, President, Sundstrand Machine Tool Company; Albert M. Johnson, President, Barnes Drill Company; L. H. Geddes, Vice President, Greenlee Brothers & Company; H. F. Collins, Works Manager, Barber-Colman Company; H. B. Newton, President,

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PRODUCTION ROUND-TABLE

Rockford Machine Tool Company and George O. Johnson, Chief Engineer, W. F. & John Barnes Company.

"Without exception, these executives expressed interest in what has been reported in this Round-Table project, with the consensus of opinion suggesting that for a long time the needs of machine tool users have deserved more frank discussion in the technical press. In the interest of more effective and economical production in metal-working, it was said, the needs of users as revealed in these Round-Table reports have been provocative and helpful."

USERS DEMAND GREATER PRODUCTIVITY

With the probability that higher labor costs will face mass production industry following the war, many earlier Round-Table participants have stated that the most important postwar machine tool requirement is the development of equipment that will prove more efficient, more productive, and require less labor operation.

The Rockford executives made it clear that they will welcome the opportunity to tackle that job, and several admitted that already they are involved in the engineering of units embodying radical improvements calculated to meet such demands from users.

Since, it was admitted, that a probable postwar trend would be toward more special unit-type machines embodying a greater degree of flexibility than possessed by many in use today, several of these other builders cannot be expected to make many changes in the basic designs of their products until the specific applications for such machines are indicated by potential users.

Regarding the machine tool builders attitude toward user-demand for improvements in postwar designs, Newton of Rockford Machine Tool Company, said, "Increasing efficiency and productivity have always been the aim of the machine tool industry. If we can't increase the productivity of the machines we build, the machine tool industry business outlook will be very bad."

HIGH PRODUCTION UNITS PROMISED

Assuming that the tendency in industry after the war would be toward high production operations in order to lower product unit costs, Collins of Barber-Colman said, "We are going to have to make more high production machines that will maintain quality. If such equipment is not used by the automotive industry, for instance, the cost of individual parts will be too high to ever bring the price of cars down to a point anywhere near what it was before the war."

Sundstrand's president, Hugo Olson, pointed out that this observation is applicable throughout. If users can't find machines that will produce more than the old type of machines, they will certainly have no way of reducing costs, and the selling price of consumer products is going to be so high this nation will suffer from serious economic dislocations.

"That's the challenge the machine tool industry has to meet," he added. "We must reduce cutting time and production costs."

Geddes of Greenlee pointed to the

machine tool industry's pride in its own engineering organizations, and stated that the industry "will not wait for the customers to tell them what is required, but will go to work and really justify its position of importance in the realm of metal-working."

"The machine tool industry is vitally interested in this problem of per piece production cost," he continued. "Not only that, but our industry possesses a humanized viewpoint that visualizes such an accomplishment not only as profitable from a business standpoint, but generally beneficial to all mankind."

In considering the demands voiced by machine tool users for more adequate chip disposal, the builders pointed to a number of complications and phases of this problem not always considered by users. More adequate methods of ejecting chips on some standard units undoubtedly will be devised, it was said. Since the nature of the jobs performed on any one machine varies from shop to shop, it was pointed out, it is not so easy for the builder to engineer something that will prove practical on every operation. In contrast to this, Johnson of W. F. & John Barnes explained, special equipment designed by the builder to handle specific jobs is now generally equipped with adequate

needs."

Rockford machine tool men viewed realistically reported user demands for simplification of maintenance through standardization of parts and accessibility of critical repair points in lubrication and power systems. They admitted that the pressure of wartime machine tool operation in their own shops has made their designing engineers more maintenance conscious. Many improvements can be looked for in postwar designs, they stated.

The question of postwar machine controls resolves itself into a matter of choice by the individual production man, Collins said. "You can't get two master mechanics to agree whether they want hydraulic or mechanical controls." On the matter of maintenance, he explained, "We have not had any easy job keeping the machines in our own shops running during the war, and trying to keep trained maintenance men to take care of them. This very condition has made our designing engineers more maintenance conscious than ever before. This will certainly be reflected in future machine tool designs."

Demands for simplification of lubrication on many machine tools was answered by the builders with the observation that as soon as the oil com-

Executives from six representative machine tool builders consider post- war trends in design requirements suggested at Production Round-Tables



disposal systems.

Albert Johnson of Barnes Drill Company foresees a trend toward new chip disposal applications on some of his concern's units. "We have a rotating table that drops chips through into a receptacle, from which they can be carried away from the machine by a conveyor system."

"As far as practical, from a design standpoint," Newton observed, "I agree exactly with what has been said. We have engineers out visiting our customers now, trying to learn what they would like in our standard types of machines after the war. We are getting some very interesting data—enough so that you may not recognize the shaper we will eventually build. We think more of these new machines will find their way into production lines than we ever considered possible with our old units."

Regarding the postwar machine tool specifications and design changes suggested to the industry recently by one large automobile manufacturer, Collins said that this "started the ball rolling. But we can't design a standard machine tool for each separate company. We can take the opinions of all the users and try to give them a machine that will fill in general all of their

panies develop a universal lubricating oil, the installation of separate lubricating systems on individual machine tools can largely be eliminated. Because of the lack of a universal lubricant today, it was pointed out, various grades of oil are required for the variety of mechanical movements in some machine tools.

Discussion of a possible postwar trend to contrast painting of machine tools for greater safety and productivity as a result of reduced worker fatigue, produced a wide divergence of opinion.

Olson pointed out that before the war painting was something to which the machine tool builders had devoted considerable attention.

The current demand by a few machine tool users for contrast painting with work areas painted in lighter hues, is something that overlooks the long research in paint and color values undertaken before the war by the National Machine Tool Builders Association. As a result of that research, it was explained, the entire industry was able to adopt a specific gray that possessed the highest light reflecting values and enabled the industry to satisfy the largest possible number of buyers

(Continued on page 136)

TOOL ENGINEERS PREPARE FOR PEACE

SYRACUSE, NEW YORK

FEATURING a technical program designed to meet the interest of men now engaged in war production but facing the problems of reconversion in the near future, the American Society of Tool Engineers convened here October 12 to 14 inclusive for its Twelfth Semi-Annual Meeting. More than 500 members and guests registered.

Consistent with the changing outlook on the production front, a two-day technical program was presented which touched upon important problems in both war output and reconversion to peacetime manufacture. Using the symposium form of technical sessions, five panels featuring 15 speakers from varied fields were presented. Theme of the meeting was "Produce for War, Prepare for Peace."

WIDE RANGE OF TOPICS

Each of the five technical sessions covered a different phase of production engineering and management. Subjects discussed included: Magnesium; Operating a Branch Plant in Canada; Tooling Instrument Work for Factory Production; and Tool Engineering Education.

In a symposium presented by International Business Machines, the use and application of that concern's electric accounting machine to "Production Control and Costs" was explained. Speakers were W. E. Crotsley, Director, Manufacturing Control Education,

Society bridges wartime and peacetime production problems in technical sessions at twelfth semi-annual meeting

and S. E. Lenox, Assistant Superintendent, Tools Division, at the company's Endicott, New York, plant.

Speaking on the "Production and Manufacturing Control" phase of this subject, Crotsley explained that production control is the method of controlling labor, tools and other factory facilities and the movement of materials pertaining to a production program, for the purpose of assuring coordinated operations throughout a manufacturing enterprise. This, he said, comprises planning, inventory control, ordering, routing, scheduling and dispatching, so that movements of material, performance of machines and operations of labor are controlled as to quality, quantity, time and place.

From conferences with executives of 110 companies during the past two years, Crotsley said he had learned that wartime production and material regulations have proved to management that there is need for a better system of factory production control. To point up the importance of the IBM card method of control, he said these concerns indicated that manual methods lack both speed and accuracy.

In setting up production control plans, he said, industry makes two mis-

takes. "They do not educate those responsible for making the plan work," he claimed. "They seem to forget the very important part the factory clerks, dispatchers and truckers have in the overall success of the plan."

Secondly, he continued, "they do not appoint some one to police the plan to see that deviations from the original plan are not occurring without the consent of those responsible. Therefore, after several months, the plan fails."

Following Crotsley's outline of production control as handled by electric accounting machine methods, S. E. Lenox explained the use of the same methods as applied to tool control in the corporation's Endicott, New York, plant.

SYSTEM FOR TOOL CONTROL

One of the major functions in any manufacturing program is the expediting of tool deliveries, and preparation of progress and load reports to give a clear indication of the progress being made, both within the plant and with outside vendors, on the procurement of tool facilities, Lenox told his audience.

Such reports must show the current status of tool procurement. The use of the IBM Accounting method insures this, he claimed. For a large tooling program, manual methods do not ordinarily show accurately the true condition, because of the time required to prepare reports from such numerous data.

For this purpose IBM Card Punching Machines are installed in the Tool



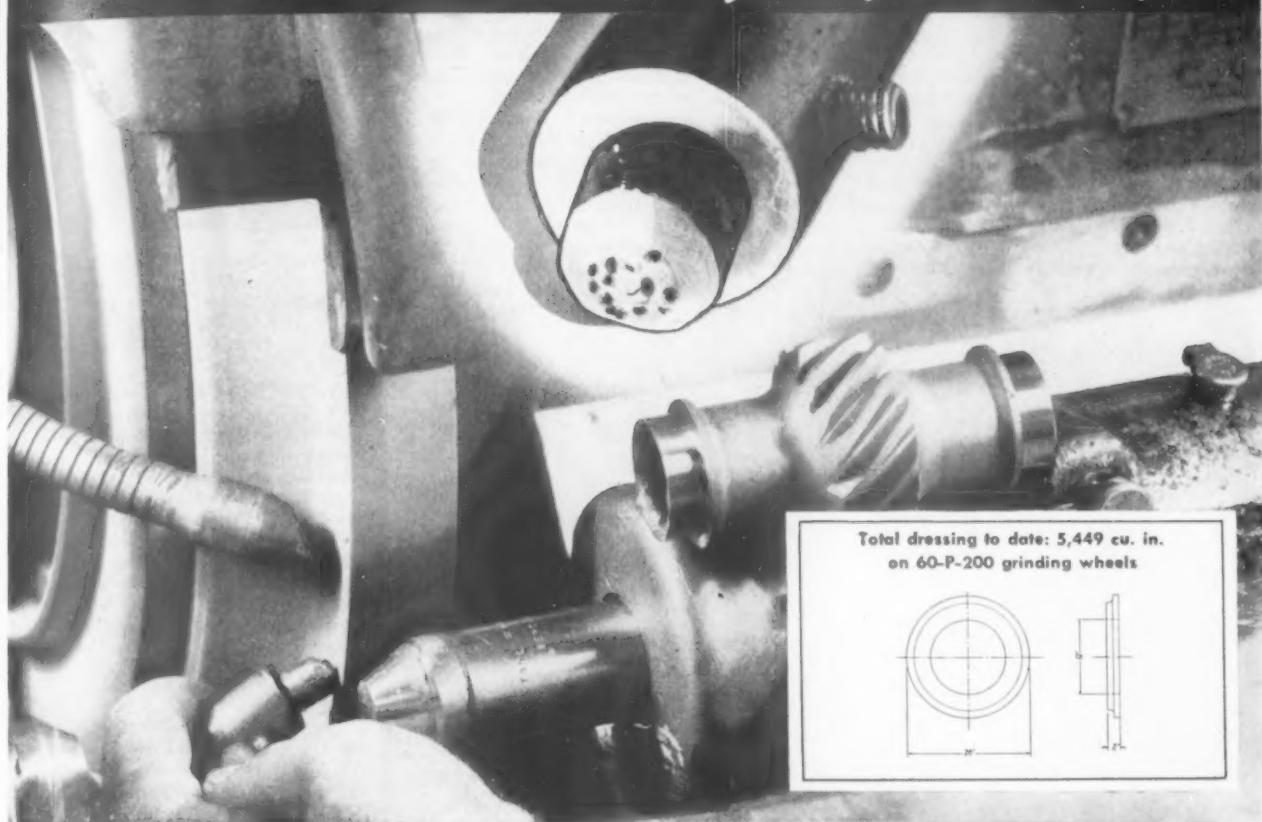
Left: Canadian industry was represented in the technical sessions by (left to right, front row) E. N. Wear, Toronto; W.A. Dawson, Hamilton; E. Kennard, St. Catherines. *Left to right,* back row: R. E. Crawford, Toronto; and Len Singer, Toronto.



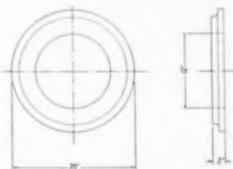
Above: Donald Babcock, ASTE Syracuse Chairman (center), with (left) S. E. Lenox, Superintendent, Tools Division, and (right) W. E. Crotsley, Director, Manufacturing Control Education, International Business Machines Corporation.

Left: One of the outstanding technical sessions was presented by Eastman Kodak Company. *Left to right:* W. R. Gordon, Chief Tool Engineer; P. G. Yingling, Process Engineer; C. G. Newton, ASTE Rochester Chairman and Pratt & Whitney District Manager; and H. C. Wellman, Training Supervisor.

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Carboloy Diamond Dressers are especially designed for unusually long periods of service on a wide range of work—the "tough" jobs as well as the "easy" ones. Loaded from base to "peak" with high quality diamond particles permanently held in a Carboloy matrix, these dressers require no remountings and provide layer upon layer of diamond cutting surfaces. Just a quarter turn daily of dresser in holder—plus an occasional 2- to 5-minute reconditioning—and the Carboloy Dresser keeps working throughout an extremely long period of profitable life. Try it once and you'll never go back to "temperamental" costly single diamonds.

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For GENERAL USE ON GRINDING WHEELS

Engineering Department, and the IBM cards are prepared directly from the handwritten orders originated by the tool engineers at the Endicott plant.

The initial information recorded on the cards includes such items as the date of the order, where ordered, date due, and delivery date; also, through appropriate codes, an accurate indication of the type of order, and where the order is placed. As the tooling program progresses and further data is received, the individual cards may be removed from the file to add such information as tool rejections, receipts, costs, cancellations, and obsolescence.

Speaking on the value of the card system of tool control, he said, "At present we are handling each week about 5,000 current items on 11 different tooling projects. To date, we have had to increase our clerical force by one individual to keep the active punching up to date on all open orders. We feel

kins, Managing Partner, Brooks & Perkins, spoke on "Fabrication Methods for Assemblies of Magnesium Sheets and Stampings."

The Detroit engineer accompanied his remarks with a display of typical magnesium alloy assemblies and extrusions.

"Machining Magnesium" was covered comprehensively in a technical paper presented by Carl J. Wiberg, Supervisor, Special Process Division, Production Engineering Department, Wright Aeronautical Corporation.

The specific methods for machining magnesium suggested by Wiberg were developed at Wright Aeronautical in the manufacture of radial aircraft engines. "Today," he said, "as many as 200 different parts are produced. These range from major sections down to small parts.

"Magnesium can and has replaced aluminum for many of the less highly



Detroit chapter members attending included, left to right, seated: A. L. Potter, J. A. Siegel, Grant Wilcox, A. M. Sargent, and A. E. Rylander. Standing, left to right: E. W. Kay, R. T. Bramson, L. Lang, J. Bartek, G. Sanborn, and J. Allman.



Members of the Host Chapter, Syracuse, who worked on meeting arrangements were, left to right seated: S. Urban, D. Babcock, B. Mitchell. Standing, left to right: R. Adams, F. Hatch, F. Mylchreest, E. Flaring, and W. Harvey.

that this is justified for the information that we are able to obtain at the time it is of value."

Opening speaker in the session on "Magnesium" was Otis E. Grant, Eastern Manager, Magnesium Division, The Dow Chemical Company. Representing the pioneer U. S. producers of this "lightest structural metal", Grant highlighted the growth of the industry and presented elementary facts on the simplicity of finishing, joining and assembly of the metal which makes it so potentially important in postwar fabrication.

Pointing out that magnesium alloys have many useful applications, but are not metallic panaceas, E. Howard Per-

stressed parts and generally speaking, of all the various engine parts fabricated from aluminum a dozen years ago, some 25 to 30 per cent are today made from magnesium."

Though Wright Aeronautical is using castings of AMS 4424 alloy, known also as Dow Chemical Alloy "H", Wiberg explained, all other alloys in common use can be machined by the same methods without any difficulty.

(Wiberg's recommendations for machining practice were almost identical to those previously outlined in the July, August and September, 1944, issues of *The Tool Engineer*.)

In the design and use of holding fix-

(Continued on page 138)

SYRACUSE MEETING NEWS NOTES



Banquet Speaker J. Y. Scott, President, Van Norman Company, and President, National Machine Tool Builders Association, chats with (left) D. D. Burnside, ASTE President.

REGISTRATION, which totaled 530, was described by society officials as exceptional in view of the inadequacy of wartime travel facilities and the pressing responsibilities in war production shouldered by many of the membership.

• Fifteen speakers were featured in five symposium-type technical sessions. Three of the speakers came from Canadian industry. The technical session room in the convention headquarters, Hotel Syracuse, was frequently crowded to capacity.

• Climax of the conclave was the Banquet and Membership meeting, attended by 274 tool engineers and guests. With President D. D. Burnside presiding, the Toastmaster was J. A. Siegel, First President. W. B. Peirce, now Third Vice-President, acted as Host.

• Banquet speaker was James Y. Scott, President, National Machine Tool Builders Association, and President, Van Norman Company. Charging the men gathered to hear him with grave responsibilities during the first period of reconversion, Scott pointed out that during the early phase of the postwar period the men who tool the nation's mass

(Continued on page 134)

J. A. Siegel, Sales Engineer, A. C. Haberkorn Machinery Company, First President, ASTE, and Syracuse Meeting Toastmaster.



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Limit lights show immediately any variation in specified dimension. No hesitation, no backstop, positive.

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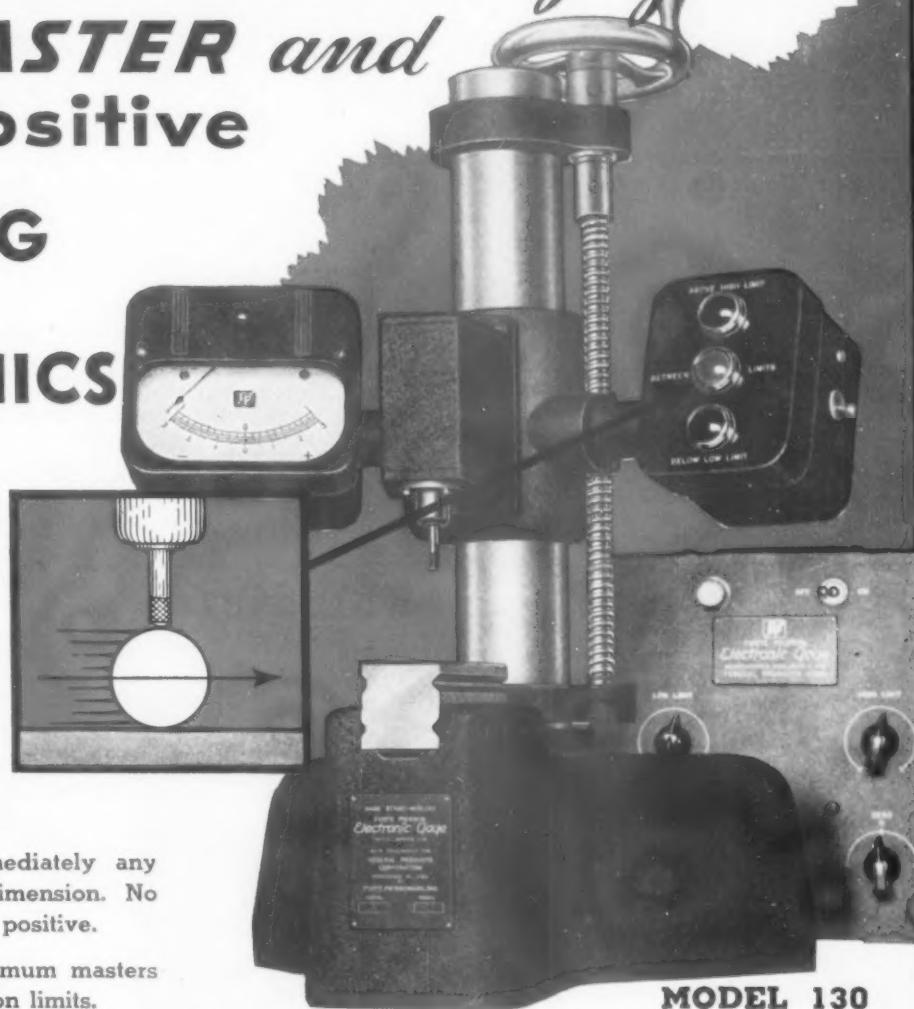
Contact pressure adjustable from 2 to 16 ozs.

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MODEL 130

This Comparator is of great value for high speed, 100% inspection at either Production or Final Inspection. The speed is unusual. There is no necessity for slowly maneuvering the workpiece under the sensitive contact to determine its maximum dimension, nor to bring it to rest against a backstop. Actual time studies indicate savings in inspection time of from 40% to 60%.

Either tolerance lights or the meter scale may be used—the lights for fast, 100% inspection; the scale for selective inspection. The indicating hand swings positively and stops definitely and quickly.

This exceptional Comparator is a decided advance in gaging devices. Its flexibility, range, sensitivity and accuracy are worth investigation.

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PRECISION MEASURING INSTRUMENTS

MACHINE TOOLS

... news and trends in the
Machine Tool Industry ...

Mid-Summer Shipments Bound Upward; Cancellations Drop

After a long climb upward, then a sharp decline, the business index of the machine tool industry leveled off early this year. Now, month by month, it is fluttering crazily like a barometric indicator in stormy weather.

August witnessed shipments bound upward again, record a substantial seven per cent increase over July. New machine tools built during August were valued at \$35,041,000, as compared with \$32,753,000 for the preceding month, the WPB's Tools Division reports in Washington.

The value of net new orders received—total orders less cancellations—increased to \$40,024,000, or a healthy 25.5 per cent over the July figure. The order book backlog likewise rose. An increase of 2.4 per cent during August brought the value of unfilled orders to \$195,818,000 at the end of August. The July backlog was valued at \$191,259,000.

The rest of the story is told in the firm orders received during August, which totaled \$42,376,000, an increase of nearly 18 per cent over the July total of \$35,959,000. August cancellations were set at \$2,352,000, a decrease of 42 per cent from the July total of \$4,070,000.

LET'S DEFEND FREE ENTERPRISE

For the interest of our readers, who are buyers and users of machine tools, leaders of the trade have been invited to present their views on various aspects of the postwar outlook of the industry. This is the ninth of a series of statements.



ROBERT J. WILKIE

PRESIDENT
CONTINENTAL MACHINES, INCORPORATED

LESS than five years ago economic upheavals were being charged to the machine, but the machine was given no credit for its contributions. This feeling went so far as to prompt the attempt of legislation against the machine.

The machine has vindicated itself. Now it is the American free enterprise system that is under attack. Practical "doers" have been so busy tending business problems they have not answered the attacks on the basic principles of freedom of opportunity. It now seems urgent for business to undertake a program of education.

We feel that the machine tool industry is one that should take the initiative. The advertising series of Warner & Swasey is an inspiring step in that direction. Since the machine tool industry cannot prosper unless all industries prosper, it is as much our task to assist in re-defining the basic principles upon which our country was built and grew, as it is to bring out new models of this product. Unless we have the fertile soil of a free economy, new cost-cutting models of our machine tools will



not provide a happy future for our industry.

To assist in this educational program we distribute each month the best books defending free enterprise. We have distributed these to our salesmen, executives and employees. It is lamentable that the sane, logical and inspiring books are not adequately publicized in the press nor read as widely as they should be.

There are many other ways in which business men can present their case. A few years back it would have seemed irrelevant for machine tool manufacturers to write letters to congressmen and in various ways undertake to defend the American way of life. Today we feel that these undertakings are some of the new kinds of activities that management must engage in to stay in business and grow.

Ratings Discarded to Aid Critical Civilian Orders

HOT SPRINGS, VA.—Reflecting a change in WPB attitude regarding civilian orders for machine tools, all preference ratings have been eliminated except on machines required for military production.

The changes in WPB Priorities Regulation Number 24, effected in Washington a few hours before the Machine Tool Builders Association gathered here October 19, were revealed to the builders here by John S. Claffee, Director, Tools Division, WPB.

Though an authorized version of the changed order was not available for the builders during their Annual Meeting, it is known that the revision definitely provides that:

(1) Preference ratings are no longer required for machine tools. Unrated orders may now be accepted by builders without WPB approval.

(2) Although deliveries within the 25 per cent of production allowed for civilian orders will still be in accordance with Prl. Reg. 1, a few ratings will be assigned to foreign and other non-military purchases. For reconversion orders in general, ratings will be granted only where critical bottlenecks exist or urgent need is demonstrated.

(3) The 60-day frozen period is now applicable to unrated orders. This means that an unrated order cannot be displaced by a rated order when production has progressed to within 60 days of completion.

WPB's intention in making these changes, it was said here, was to give the builders an opportunity to make reasonable promises on delivery dates to those industries in critical need of machine tools for speedy reconversion to peacetime manufacture.

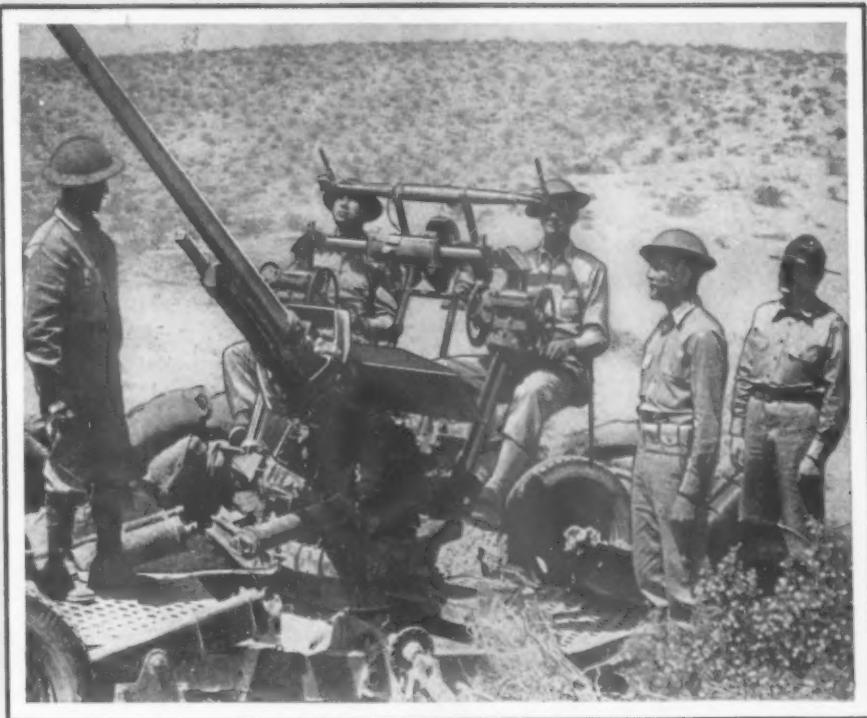
Obviously, it is not a cure-all for the situation caused by the demands of automobile makers that their orders be given preference after war production orders have been filled. Since many of the machines needed by the automen will require three to six months to build, the 60-day clause offers little protection. As the order stands now, such civilian orders are subject to being knocked down in preference by military orders until they reach a point within 60-day of completion.

The machine tool split-production program recently laid down by WPB will be continued. This calls for the application of 75 per cent of a builder's production to military and previously rated orders. The remaining 25 per cent of production will be devoted to other purchases, hereafter unrated.

Though it is assumed that these will be filled in the order that they are received by the builder, it is known that WPB is strongly advising the builders to give preference to those industries which will be in critical need of machines in order to reduce the reconversion unemployment lag. This can mean only one thing: The auto industry orders will get the inside track.

Machine Tool Builders Annual Meeting
—See Page 109.

THE TOOL ENGINEER



Shooting the "BIG DUCKS" MILES AWAY

Shooting enemy planes at a distance of several miles is like shooting big ducks on a grand scale. The gunner must "lead" the target to allow for its movement while the shell is getting there.

Hence, the antiaircraft gun is never sighted at what it is trying to kill—but at some point in advance of the target.

The eye and experience of the most expert duck hunter would be of little use in shooting these "big ducks." The pointing of the gun is a complicated mathematical problem, solved by an elaborate plotting machine. The gun must follow orders of this plotting device with utmost exactness.

Without precision of the very highest order in every critical part, the gun couldn't hit the "big ducks." Antiaircraft fire would be mildly annoying instead of having deadly accuracy.

Microhoning contributes largely to this re-

sult because it provides the modern production approach to precision in final stock removal—maximum precision control of surface character.

Without this production approach to precision, it would be impossible to build these "big duck" guns in the quantities needed.

Some Microhoned Bores in Antiaircraft and Other Ordnance

Rifle Barrel Lands • Rifle Barrel Grooves • Recuperator Cylinders • Regulator Cylinders • Variable Recoil Cylinders • Rifle Hoops • Tapered Gun Chambers . . . (Guns from 2½ feet to 75 feet long—.30 caliber to 16 inch in diameter).

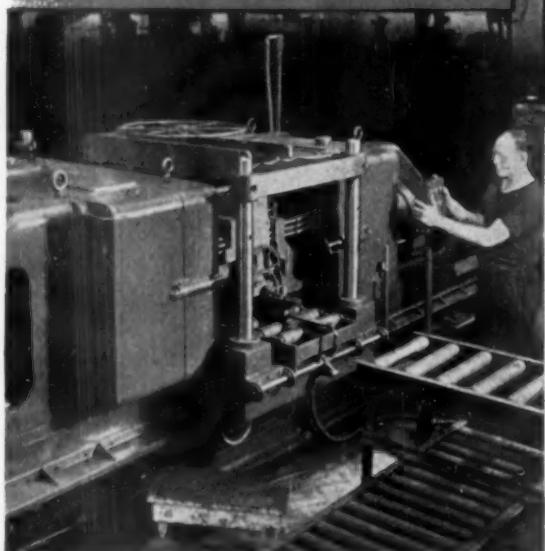


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Cylinder block being drilled on W. F. and John Barnes machine.

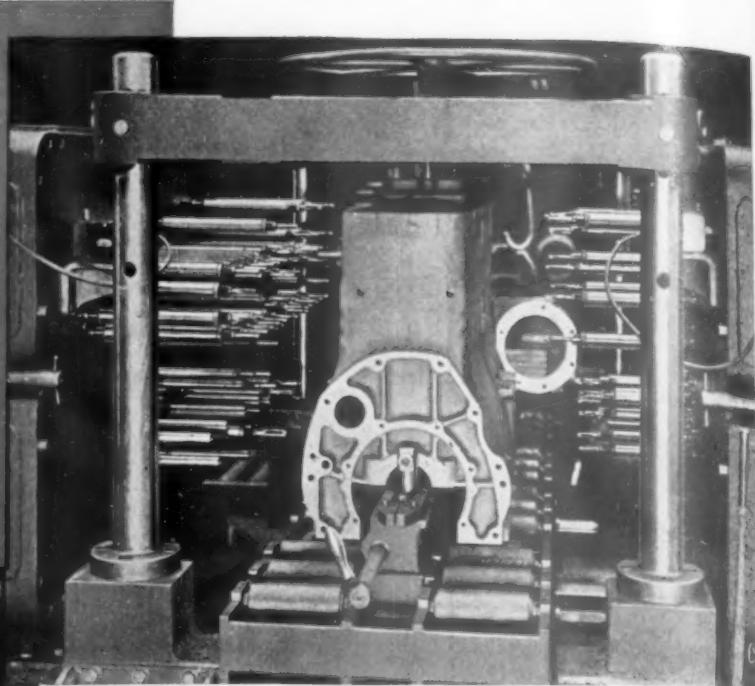
**FREE
DESCRIPTIVE
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How boring, drilling, reaming, tapping and milling operations can be done simultaneously is described in thirteen helpful booklets. This useful information shows how W. F. and John Barnes machines are designed to meet specific requirements. Write today for this data which may suggest a tooling or production set-up for you — ask for Bulletin No. 1144A.



W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



Special tapping heads and holding fixture designed and built by manufacturer for W. F. and John Barnes machine.

**PRODUCTION INCREASED FROM 720 TO
2000 CYLINDER BLOCKS PER MONTH**

Machining blocks by former methods including single spindle drilling and tapping machines cost this manufacturer \$13.75 each. By installing three Barnes machines to do the drilling and tapping operations only, total unit cost was reduced to \$7.50. Production jumped from 720 blocks to 2000 blocks per month with a gross savings of \$12,500 per month.

The manufacturer designed and built the drilling and tapping heads required for the cylinder block. Barnes built the machines to accommodate these special heads. It was through this collaboration of the manufacturer's engineers and Barnes' engineers that it was possible to build these three machines.

Regardless of how complicated or difficult you consider your machining problems, it is possible they may be readily solved by consulting our engineers. Just submit your problems to us, recommendations will be made without obligation.

Postwar Surplus Policy Charted at Machine Tool Builders Meeting

HOT SPRINGS, VA.—On the threshold of a new and unpredictable chapter in the history of their industry, members of the National Machine Tool Builders Association met here October 19-20, for their 43rd Annual Meeting.

Currently squeezed by a manpower shortage, pressed for deliveries by the armed forces on one hand and reconversion-conscious auto makers on the other, the builders were well aware that during the next few months their industry would come face to face with its own postwar problems.

Energetic Joseph Trecker, new NMTB President, summed up the industry outlook when he said "machine tools are the key to productivity and to the whole postwar economy of the United States."

POSTWAR MARKET UNCERTAIN

Little evidence of concrete opinion on the probable extent of the postwar market could be found at Hot Springs. But Trecker predicted good production after Germany collapses and during the Japanese phase of the war. "But this period," he said, "will be one of false prosperity for us." After the war, he added, the only reason machine tools will be bought will be "to cut costs. Let us remember that."

The youthful Milwaukee executive reminded his fellow-builders of the days when machine tools were damned for putting people out of work, and insisted that the Association continue its educational crusade to clarify the role machine tools play in the nation's economic life.

Calling upon the builders to continue demanding that they be allowed to produce machines critically needed for national reconversion to peacetime operation, he warned "if we don't watch out our industry will be charged as the bot-

tleneck in reconversion."

If anything could be identified as a meeting theme, it was the insistence by industry leaders that serious trouble lies ahead unless the Government changes its attitude on "reconversion orders."

Restrictions upon production of machines for peacetime purposes are definitely threatening the country's post-war program of production and employment, charged James Y. Scott, Retiring Association President.

"There are key machine tools which the automobile industry needs right away if it is to be able to effect a quick conversion from war to peace. The automobile industry is not getting those machine tools," Scott said.

"Until the various governmental agencies concerned realize that unless the machine tool industry is permitted right now to build certain critical machine tools, the postwar re-employment program of the United States may run onto the rocks."

GOVERNMENT ATTITUDE WRONG

Scott, President of the Van Norman Company, struck a responsive note when he said, "Today it's manpower. It used to be materials. Tomorrow it may be something else. What's needed is a change in government attitude. If we are going to 'win our peace', we've got to start now. It is later than you think."

What the industry policy might be on disposal of the estimated 500,000 surplus machine tools that will glut the market after the war was revealed in a committee report by Walter K. Bailey, Vice President, The Warner & Swasey Company.

Bailey called for an industry-wide effort to put these surplus machines to work in American plants. Get them out

NMTB NAMES NEW OFFICERS

• New President of the National Machine Tool Builders Association is Joseph L. Trecker, Vice President, Kearney & Trecker Corporation. William P. Kirk, Vice President, Pratt & Whitney Division, Niles-Bement-Pond Company, was elected First Vice President; Herbert H. Pease, President, New Britain-Gridley Machine Division, The New Britain Machine Company, was named Second Vice President; and Crawford N. Kirkpatrick, President, Landis Machine Company, was appointed Treasurer.

Newly elected Directors are Herbert Pease; A. M. Johnson, President, Barnes Drill Company; and H. W. Bockhoff, President, National Automatic Tool Company.

Special feature of the Annual Dinner was presentation of silver awards to the four NMTB Presidents of more than 20 years ago. Those honored were:

Frederick L. Eberhardt, President, Gould & Eberhardt, Inc. (1907-09); Edward P. Bullard, Jr., President, The Bullard Company (1911-13); James Burton Doan, Chairman of the Board, The American Tool Works Company (1915-18); and August H. Tuechler, President, The Cincinnati Bickford Company (1920-22). All were present except Mr. Bullard, who was recovering from a minor injury.

of the way as soon as possible, he argued, and they will not continue to deflate the postwar market, stand in the way of new machine tool sales. The Warner & Swasey executive reasoned that every builder should devote part of his advertising to the value of replacing "junkers" with good surplus machines, sell their customers "some new machines, some old machines."

"To keep employment going at a high level we've got to have assured mass markets. We can only assure mass markets by low production costs. We can only assure low production

(Concluded on page 130)



Above: R. M. Gaylord, President, the Ingersoll Milling Machine Company, and (right) J. Y. Scott, President, Van Norman Company, and Retiring NMTB President. Gaylord is President of the National Association of Manufacturers.

Left: W. K. Bailey, Vice President, The Warner & Swasey Company, outlined a proposed industry policy on surplus machine tools.

Right: A. G. Bryant, Vice President, Cleereman Machine Tool Company, who has led the industry's program of "Washington education".

Announcing

The NORTON *Bura-way* Precision Form Tool Grinder

The Norton Bura-way Grinder combines new principles in the design of cutting tools in a machine which generates, reproduces and maintains relief angles constant as measured in the direction of feed. This provides the entire cutting edge of a tool with a uniform, adequate support including sections involving curves and radii.

The NORTON *Bura-way*

- Will Lengthen Tool Life
- Will Increase Production
- Will Reduce Inventory of
Production Tools
- Is Readily Adapted to your
Tool Room Procedure

NORTON COMPANY
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NORTON and **GRINDERS**
Lappers



CAPITAL COMMUNIQUE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

T. N. SANDIFER

Special dispatch from The Bramson Publishing Company's Correspondent in the nation's capital

WASHINGTON

As a topic of official comment around Washington, V-E Day is more or less suppressed at this stage. There seems to be a feeling here that in the late Summer too much emphasis was placed on the possibilities of a day that is still, at this writing, over the hill somewhere in Germany.

Some justification can be found for this reversal of official attitude in the war production outlook for the remainder of the year. In December, last year, war production hit a peak, measured in terms of dollars—\$5,600,000,000. At no stage since has it been geared up to this level, during 1944.

WAR PROGRAM STILL STUPENDOUS

Bearing that figure in mind, consider the fact that for September the production goal was set for \$5,800,000,000, and for the remainder of 1944, at \$5,900,000,000—in other words, after all the talk of V-E Day, the war production program is pitched at a level now, that exceeds anything industry has been able to reach so far, by several hundred million dollars per month.

The war will have to end very suddenly to change any of this, it is generally believed here, and this indication is borne out by all that has been said so far on curtailments that will follow the German collapse.

The War Production Board is sticking to its projected 40 percent cut in war output, as rapidly as possible after the anticipated event. But, it is now emphasized, these cuts are not going to be made the next day after the German collapse. The best estimate at WPB is that between 60 to 70 percent of the total 40 percent reduction will be made in the first two months after the collapse. The remainder of the reductions necessary to reach the 40 percent figure will be spaced out over five or perhaps six months more.

FIGHTING CERTAIN BOTTLENECKS

Meanwhile much of what is heard here sounds like the war was in mid-career. It may seem late to be talking of machine tool bottlenecks, but a lot of that talk is heard. There has recently been a sharp increase in schedules for extra-heavy calibre ammunition, schedules which producers are said to be having difficulty in trying to meet. And, says WPB, the bottleneck in that is machine tools.

Facilities are available, or nearing completion, for production of the required amount. But, it is reported, these require a tremendous amount of special machine tools. The result has been to overload producers of these special machines; in turn there is dif-

ficulty in meeting production schedules on these machines, sufficiently to keep pace with the facilities going up, or ready. Manpower is a serious question in this case, it is stated. Some 12,000 men are needed in certain machine tool companies to turn out this specialized equipment.

The special equipment, for this particular program, can only be turned out in a few plants. These plants require labor of a high type, which it is late in the day to be seeking, it is admitted.

The current atmosphere is such that continued discussion of post-V-E Day plans seems paradoxical, but it is typical of the whole situation that the Government, at least, is having to "talk out of both sides of its mouth" and is having to cultivate the accomplishment as a legitimate necessity.

On the basis of reports from the various war-producing agencies in Washington, it has now been estimated what the 40 percent curtailment of war output will spell in terms of national economy. First, it will release, prob-

• Johns-Manville Corporation filed Government reports at a rate of one each two minutes last year. In all, the firm prepared 71,588 reports and questionnaires during 1943, stockholders were told.

ably gradually, about 4,000,000 workers. The present outlook is that these will be absorbed in reviving peacetime production, on a large scale, especially if this production is maintained at the anticipated level that prevailed in 1939.

In overall effect on the business and industrial life of the country, V-E Day means a gradual (over a period of months) decline measured in dollars, that will approximate \$12 billion. This is not a sure index of the actual rate of activity, it is said, because war dollars are somewhat inflated, but it does measure the expected drop in production and business from the war level. Part, or all of this, may be absorbed in a spurt of making civilian goods.

Much of the talk heard here, accordingly, is how to cut down any possible lag between war output and resumption on a sustaining scale of civilian goods production. The RFC has let it be known, informally, that while it can take a considerable time to move Government equipment out of a plant when the occasion demands, it will not necessarily do so. If an industry cannot conveniently store equipment which it does not want, and which be-

longs to the Government, every effort will be made to get the plant cleared.

Designed to insure prompt removal of Government-owned equipment when no longer needed by a private operator, the Office of Civilian Supply has issued a regulation providing for waiving of certain arrangements under which contractors are required to maintain equipment in stand-by condition, except when necessary for other war production or national defense.

Authorities have stressed that it is important for manufacturers to decide promptly what they will want to keep, and to take up clearance questions promptly with the proper Government office. It is also recognized that it is equally important that the manufacturer know what tools he will be allowed to buy, and to know what other equipment will be moved when not needed in the plant in question.

REGULATION PERMITS SOME ACTION

Under the OCS regulation mentioned, the contractor may either buy the equipment in his plant, or have it removed within 60 days after request is made for removal, unless necessary for other war use. Contracting agencies are authorized to sell to war contractors Government-owned tools now in use in their plants. Small plants as well as large ones will be allowed to purchase such equipment, provided it is not needed for other war purposes. Prices will be fixed in most instances, by the Surplus Property Administration, based on the age of the tools.

Meanwhile: WPB has given tentative assurance to all key industries that they will be given essential machine tools for reconversion when the time comes.

J. A. Krug, WPB chairman for reconversion, stated recently: "We have adopted here from the start, the policy that we would do everything possible to speed the period of transition from war production to peacetime production, when it is possible to go back—that is everything possible without interfering with the war effort."

He has instigated a plan under which each key industry will be handled at WPB by a specific organization, in returning them to civilian output when possible. The automobile industry however, recently protested that unless they could get certain things done beforehand, with WPB help, it might take them six to nine months to produce post-war cars.

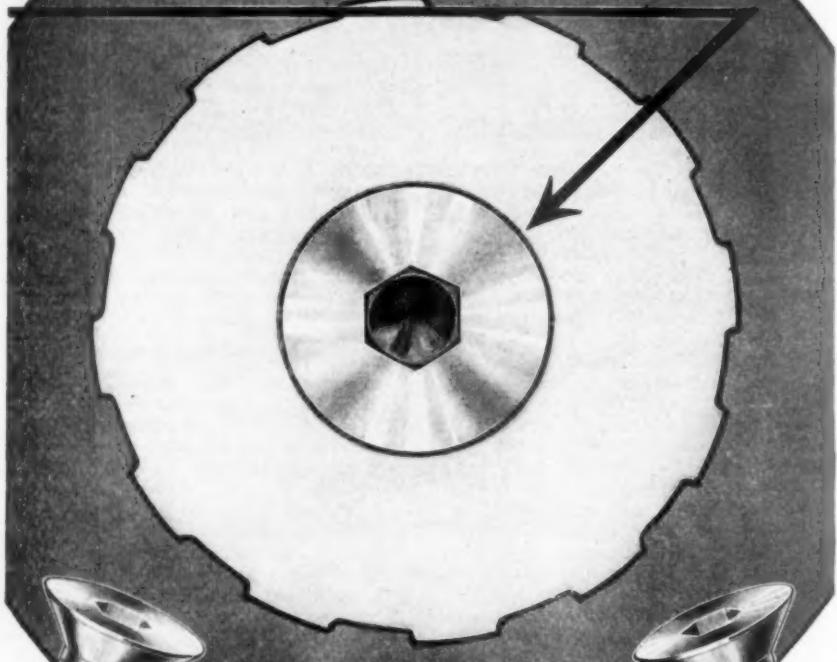
WPB ATTITUDE ON TOOLS

With reference to general reconversion, Mr. Krug said recently that WPB was confident it could give the auto industry, as well as others, considerable help. He pointed out that WPB had sanctioned moves to insure that models for new production, as well as technically qualified personnel for design work, were available. However, it was understood earlier that regarding certain requested priorities on tools for the automobile industry ahead of some other civilian production, Krug was very unwilling to agree to such a move for any industry.

It is the WPB view that when it gets the specific requirements for machine tools that all industries must have to

(Concluded on following page)

FLUSH!



ALLEN FLAT HEAD CAP SCREWS

They set up in a counterbored hole more truly *flush* than any other type of hollow screw. The V-head fits the counterbore with complete *closed contact* all-round. This gives frictional holding-power and rigidity of grip... "Pressur-formd" of ALLENOY steel, with uncut metal fibres shaped to the head.

Threads also are *pressur-formd*, with tolerances held to a high Class 3 fit. Strength and precision distinguish these screws in all their applications.

Ask your local Industrial Distributor for samples and dimensional data,—the same Allen Distributor who serves your interests with the most dependable supply-items in all lines.



THE ALLEN MANUFACTURING COMPANY
HARTFORD, ★ ALLEN ★ CONNECTICUT, U.S.A.

— CAPITAL COMMUNIQUE —

(Concluded from preceding page)

convert, the agency can then schedule them for production without great difficulty on a reasonable time sequence that will fit into the conversion program. This does not mean the tools every industry would like to have, or would regard as ideal, but the ones it must have.

WPB is now engaged in working out such a plan with the major industries involved; taking the lists of tools they want, and screening such lists to eliminate the fancy from the essential, as WPB sees it.

ARE TOOL DEMANDS EXCESSIVE?

The result will be a list of bare minimum tool needs, it is conceded, but WPB believes that it can schedule the tools that remain on such a list and get delivery on time. The Machine Tool Order is being revised in conformity with this plan, it is reported.

The using industries are being urged in the interim, to schedule their needs on the basis of minimum requirements, and the report is that many industries are cooperating.

WPB has indicated meanwhile, that it does not have in mind any limitation of automobile models, although it is known that this has been discussed with the industry. Krug has an idea, so far as machine tool requirements go, that some industry tool requirements as disclosed so far, are higher than actual needs would dictate. He believes some industries feel that they could do a better job, when the time comes, if they have for example, some of the newer Government-owned tools.

There have been a considerable number of applications for Government-owned special purpose machines, it is known. The estimate at WPB is that the auto industry would take 90 percent of such orders. The tools involved in the program so far, it is indicated, will go into production shortly. The whole reconversion procedure is being kept flexible at this stage, it is said, to meet ups and downs in the war course.

OVERSTOCKED BY LEND-LEASE?

In short, the tone of what is heard here, is cautious on all developments, war or after-the-war. Manpower is still critical in some industries, and with regard to the program as of now, there is said to be a 200,000-man shortage, not the same kind of workers as when the figure was arrived at initially, but still that many men, it said.

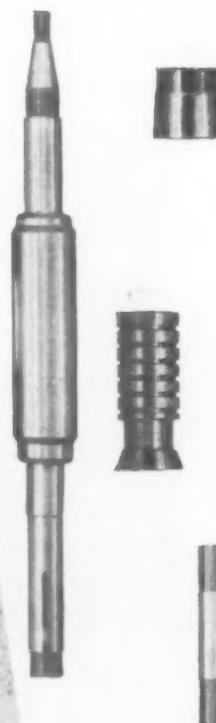
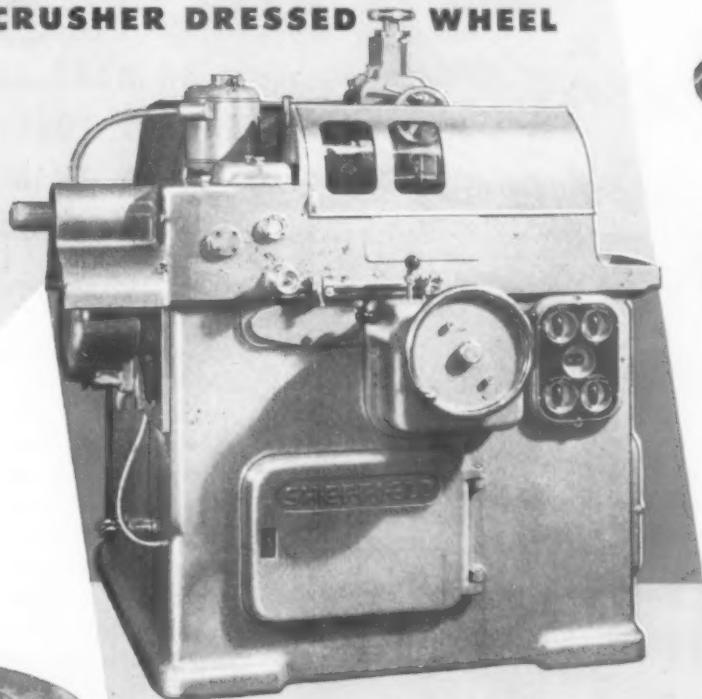
What was said earlier about machine tool bottlenecks, is of course, not susceptible of general application. It applies only to some special machines. Actually, there is still the prospect of a very large surplus of machines, and despite all the talk of maybe shipping some of this equipment to other countries that may want to tool up for peacetime industry, there is at least one country that probably won't be in the market. The British, it is now being revealed, have more than they know what they are going to do with. They received \$169,000,000 worth under Lend-Lease, and currently have a mission over here to see what this country might be willing to do about it, when settlements are balanced.

THE END

THREADS and FORMS

PLUNGE GROUND

WITH CRUSHER DRESSED WHEEL



The crusher dressed multi-ribbed grinding wheel offers important savings in both time and production costs in grinding precision threads and circular form or profile work.

In a plunge cut with such a wheel on the Sheffield Thread and Form Grinder, a single or multi-start threaded section, the length of which does not exceed the thickness of the wheel, is completed in $1\frac{1}{2}$ revolutions of the work part. For larger parts traverse grinding is used.

Wheels are crusher dressed in a small fraction of the time it takes by conventional methods and they have more effective cutting surfaces. Furthermore, the multi-ribbed wheel stands up longer.

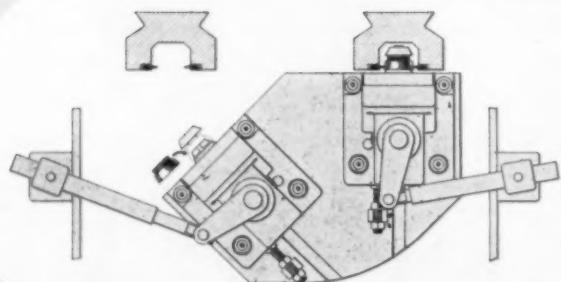
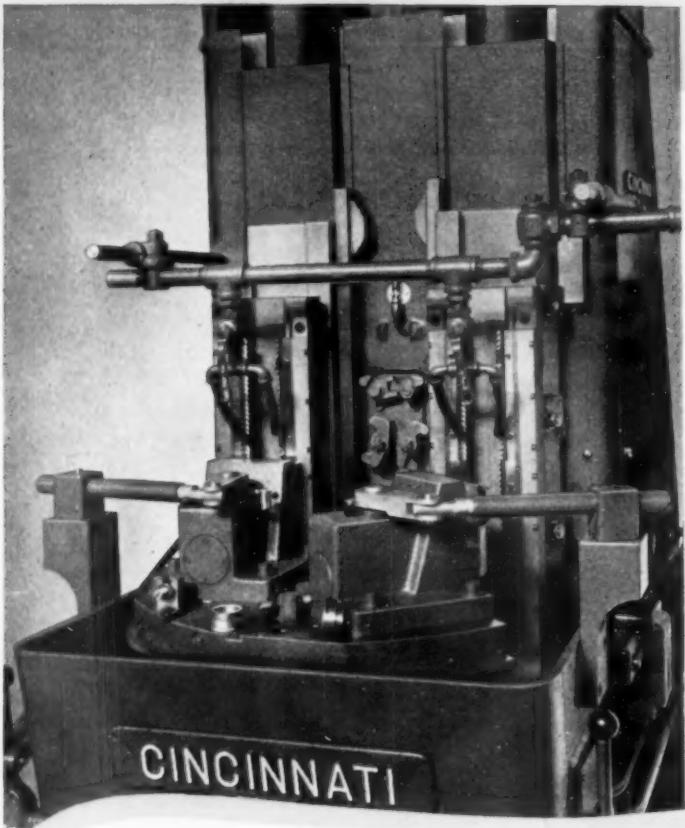
Write for technical bulletin.



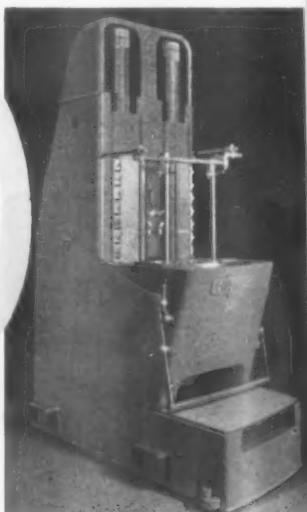
JUST REMOVE BROACH
PART - AND DROP IN ANOTHER

*it's as simple
as that*

NO HAND CLAMPING OR
MANUAL LOCATING REQUIRED
WITH THIS CINCINNATI
ENGINEERED EQUIPMENT



Simplified drawing showing
how the parts are automatically
located and clamped,
prior to the down stroke of
the ram.



Right: CINCINNATI No. 5-42 Duplex Vertical Hydro-Broach.
Catalog M-894-2 gives complete specifications. For a brief
description, look in Sweet's Catalog File.



THE CINCINNATI MILLING MACHINE CO. CINCINNATI
OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... CUTTER SHARPENING MACHINES

INDUSTRIAL NEWS DIGEST

... a review of significant developments and new techniques
in mass production industries ...

NTDMA Elects Officers; Moore Becomes President

CLEVELAND—Richard F. Moore, President, Moore Special Tool Company, Incorporated, Bridgeport, Conn.; has been named President of the National Tool and Die Manufacturers Association.

Moore was elected at a convention held here marking the first year of the association's existence. He succeeds L. A. Sommer, President, The Sommer and Adams Company, Cleveland, who is credited with founding the trade organization.

Other officers elected were Vice-President, Willis G. Ehrhardt, President, Ehrhardt Tool & Machine Company, St. Louis; Treasurer, H. F. Jahn, President, The B. Jahn Manu-



Moore: elected to new office.

facturing Company, New Britain, Conn., and Secretary, Ben Buerk, President, Buerk Tool Works, Buffalo.

Board of Directors members are L. A. Sommer, Cleveland; Eugene J. Rowan, Jr., Nelpin Manufacturing Company, Long Island City, N. Y., also named New York Director of the association; Carl A. Erickson, President, Erickson Machine Works, Incorporated, Minneapolis; K. Janiszewski, President, Superior Steel Products Corporation, Milwaukee; William R. White, Jr., Vice-President, Midwestern Tool Company, Chicago; and W. J. Tallman, National Tool & Machine Company, Rochester.

The NTDMA was organized a year ago to help alleviate war conditions which struck the tool and die industry, particularly in manpower, because of the long apprenticeships workers must serve to gain necessary skills.

The association's objectives, according to a statement of policy, include: Contribute to the highest degree toward

the speedy culmination of the war; insure the maximum use of the tool and die industry in the reconversion period; oppose bureaucratic ideas and unfair government competition and inequalities to small plant owners; and develop a sound apprenticeship program.

The association currently is working on a labor relations program to be announced at a later date, it was stated.

Electronics Training Course Available on Slide Films

PITTSBURGH—Basic principles and applications of electronics in industry are subjects of a new 10-part training course covered by sound slide films, lesson and quiz books, and an instructor's manual prepared by Westinghouse Electric and Manufacturing.

Although designed for its own employees, the Westinghouse material has been made generally available at reproduction costs because of many requests from engineering groups and individuals interested in electronics.

It is recommended that 20 hours be allowed for the full 10-part course—two hours for each part, with classes held one night a week, thus giving students an opportunity for review and

SAFETY OVERHEAD



To protect lift truck operators, Douglas Aircraft safety engineers designed a heavy canopy installed on many of the material handling units in their plants. The lift truck with overhead guard pictured is in the Douglas, Long Beach, California, factory.

supplemental reading.

Sound slide films and records for the 10 lessons are said to give clear, visual explanations of basic theory and applications. Lesson books in pocket size, reproducing the subject matter for each lesson, are provided. These afford a convenient means of review and supplemental study. Quiz books for mid-course and final review, and an instructor's manual giving suggested classroom procedure is provided with the course.

(Continued on following page)

"GREENIE"

T.M. REG. BY THE BRANSON PUBLISHING COMPANY

Undercover Work



INDUSTRIAL NEWS DIGEST

(Continued from preceding page)

Literature on industrial electronic equipment is supplied covering ignitron rectifiers, high-frequency heating, resistance welding, power line carrier, rototrol, scaled ignitron, and electronic tube data sheets.

Bailey Succeeds Gates as President of ASME

NEW YORK—Alex D. Bailey, Vice President, Commonwealth Edison Company, Chicago, and well known in the fields of large steam-station management and in engineering education, has been elected President of the American Society of Mechanical Engineers.

Bailey's election was announced by the Society after tabulation of letter ballot of approximately 18,000 ASME members. He succeeds Robert M. Gates, and will assume his new position at the annual meeting of the Society in New York in November.

Three Vice Presidents elected for two-year terms were: David Larkin, Vice President and General Manager, Broderick and Bascom Rope Company; John E. Lovely, Vice President, Jones and Lamson Machine Company; and Thomas S. McEwan, Vice President, McClure, Haddon and Ortman, Incor-

porated.

Three Managers elected for three years to serve on the Council, governing body of the Society were: Daniel S. Ellis, Vice President in charge of manufacturing, Lima Locomotive Works, Incorporated; Arthur J. Kerr, District Manager of Sales, Pittsburgh Equitable Meter Company; and Herman George Thielser, Mechanical Engineer, Potomac Electric Power Company.

WPB Frees Gages From Rating Requirement

WASHINGTON — Production of gages and precision measuring hand tools is now considered adequate for all essential demand, the WPB Tools Division has announced.

Accordingly, suppliers may purchase these items without ratings, and the use of WPB Form 547 covering the Distributor's Rating has been discontinued. Likewise, the WPB order E-5-A, which required that manufacturers of gages and precision hand tools restrict shipments to rated orders, has been revoked. Manufacturers need no longer set aside a percentage of production for jobbers and dealers, WPB said.

• Much credit is deserved by the tool industry for the victory America has achieved on the war production front. Looking to the future, trends in mass manufacturing in the metal-working field are contingent on wartime and postwar developments in machines and tools. Here is the postwar outlook of one of the outstanding leaders in this field.

WAR EXPERIENCE MAKES INDUSTRY PRECISION CONSCIOUS



FREDERICK S. BLACKALL, JR.

PRESIDENT AND TREASURER
THE TAFT-PEIRCE
MANUFACTURING COMPANY

EXPERIENCE during the period following World War One indicates clearly that the industrial expansion which occurs under the impetus of war has a permanent educational value to industry at large, fostering to a marked degree appreciation of the value of precision tools and widening their use.

Many firms, which employed crude manufacturing methods prior to the present war, have become production and precision conscious as a result of their war experience. Thus, a definite growth in the normal demand for equipment of this character can reasonably be expected during the postwar era. Other factors also point to mounting postwar tool sales.

For example, there has been a vast development in cutting tools during the past four or five years,



not only in materials of which they are made, but in their design and dimensional characteristics, which will render many an existing tool crib obsolescent. Machining and inspection practices have undergone radical changes, which will involve a wider use of tools and gages. And finally, a normal secular growth in the demand for tools will have occurred during the war years.

The integration of these forces would seem to point to enlarged normal sales volumes for tool manufacturers during any normal postwar year, when judged in the light of established pre-war standards of performance.



Well known in the precision instrument and machine tool industry, C. H. Reynolds (left), Vice President, Sheffield Corporation, receives his company's 25-year service pin. Donor is Louis Polk, Sheffield President

WPB Advances Campbell; Murphy Returns to Industry

WASHINGTON—John B. Campbell has been named WPB Deputy Vice Chairman for Production by Hiland G. Batcheller, Operations Vice Chairman. Campbell succeeds William B. Murphy, who has resigned to return to Campbell Soup Company.

Campbell, who is also Chairman of the Automotive Production Committee and the National Forge and Foundry Committee, has been with the Board since April, 1942, having served as Assistant Deputy Vice Chairman for Production since October, 1943.

For 20 years before joining WPB, Campbell was associated with Fairbanks Morse & Company and Pettibone-Mulliken Company.

New Committee on Problems of Tap and Die Industry

WASHINGTON—After holding its first meeting to discuss problems relating to procurement and delivery of tools, the membership of a new industry advisory committee to represent the Carbon Tap and Die Industry was announced by the WPB.

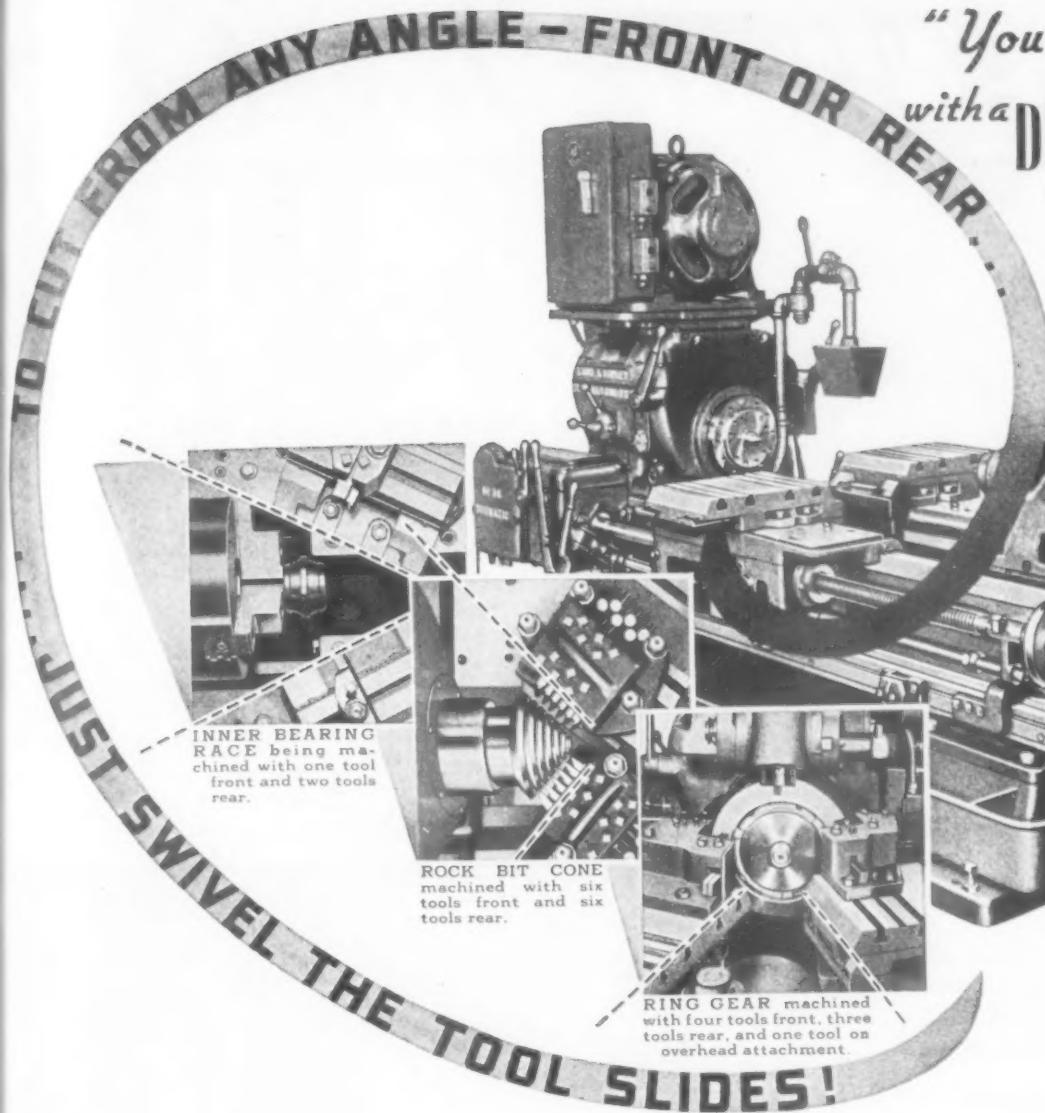
Committee members are: John Cook, Winter Brothers Company; C. H. Davis, Vermont Tap and Die Corporation; William B. Eberlein, Greenfield Tap and Die Corporation; H. Lloyd Hanson, Henry L. Hanson Company; F. O. Lincoln, Morse Twist Drill & Machine Company; Louis A. Lincoln, Bay State Tap and Die Company; Frank Morrison, W. L. Brubaker and Brothers Company; E. W. Nestor, Reiff & Nestor Company; Charles M. Pond, Pratt and Whitney Division, Niles-Bement-Pond Company; K. Y. Taylor, Jr., Charles H. Besly and Company.

Chief problem facing the industry conferees was the recent cut of 50 per cent in Lend-Lease orders for Carbon dies because of insufficient production. Tap orders were not cut.

Although sufficient plant capacity for carbon taps and dies exists, shortages of skilled manpower in certain areas

(Continued on page 120)

"*You can do it*
with a **DUOMATIC**"



ENGINE
AUTOMATIC
TOOL ROOM
OIL COUNTRY
LATHES

T

To obtain unlimited cutting angles on the Lodge & Shipley Duomatic Lathe, only the simplest adjustments are required. With the dual carriages and tool slides—front and rear—multiple tools are used in turning and in straight and angular facing operations never before possible with so little effort. The most difficult bevel cuts are performed with remarkable ease.

The massive tool slides of the Duomatic are solidly supported, insuring stability even under heaviest cuts, and are readily swiveled to give a power feed and power traverse movement at any angle. When the tool slide is rotated through an angle of 180°,

the direction of feed motion is reversed so that facing cuts travel away as well as toward the centerline.

These outstanding improvements, greatly widening the range of cutting operations, are typical of the many time-saving, labor-saving advantages offered in the Duomatic. As a result, the Duomatic stands unchallenged among automatic lathes for simplicity and adaptability, handling large or small lots with equal facility. For more detailed information, call on Lodge & Shipley Engineers or write on your company's letterhead for Bulletin 601-FL.

LODGE & **S**HIPLEY MACHINE TOOL CO.
CINCINNATI 25, OHIO, U.S.A.



Why "NIBBLE" Templates?



Do ALL MAKES THEM FASTER and SMOOTHER

The Nibbler has no work table. Job must be carefully guided by hand. Finished edges are rough. Much material is reduced to waste chips. Work thickness is limited to thin plate stocks.

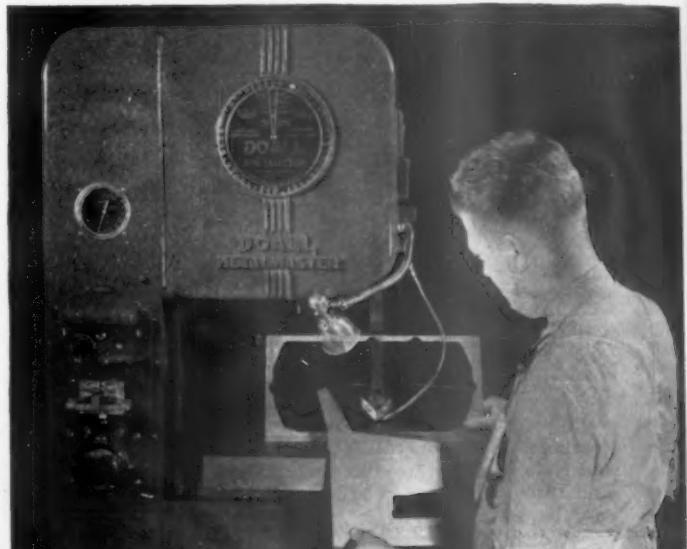
The DoALL's thin cutting blade follows layout lines accurately. Edges are smooth and straight. No metal is wasted. DoALL takes work a foot thick, or you can cut 100 or more shapes at one time from stacked sheets.

The DoALL has cut its way through millions of feet of metals, alloys, plastics, laminates, plywood and composition materials that have gone into war production work.

The DoALL laughs at former cutting records by doing internal and external sawing in 1/4 to 1/10 the time of other methods.

If there is one machine tool that deserves your attention now and after the war, it's the DoALL.

The circular DoALL ADVANTAGES tells a graphic, time-saving story. Send for copy.



DoALL

INDUSTRY'S NEW SET OF TOOLS

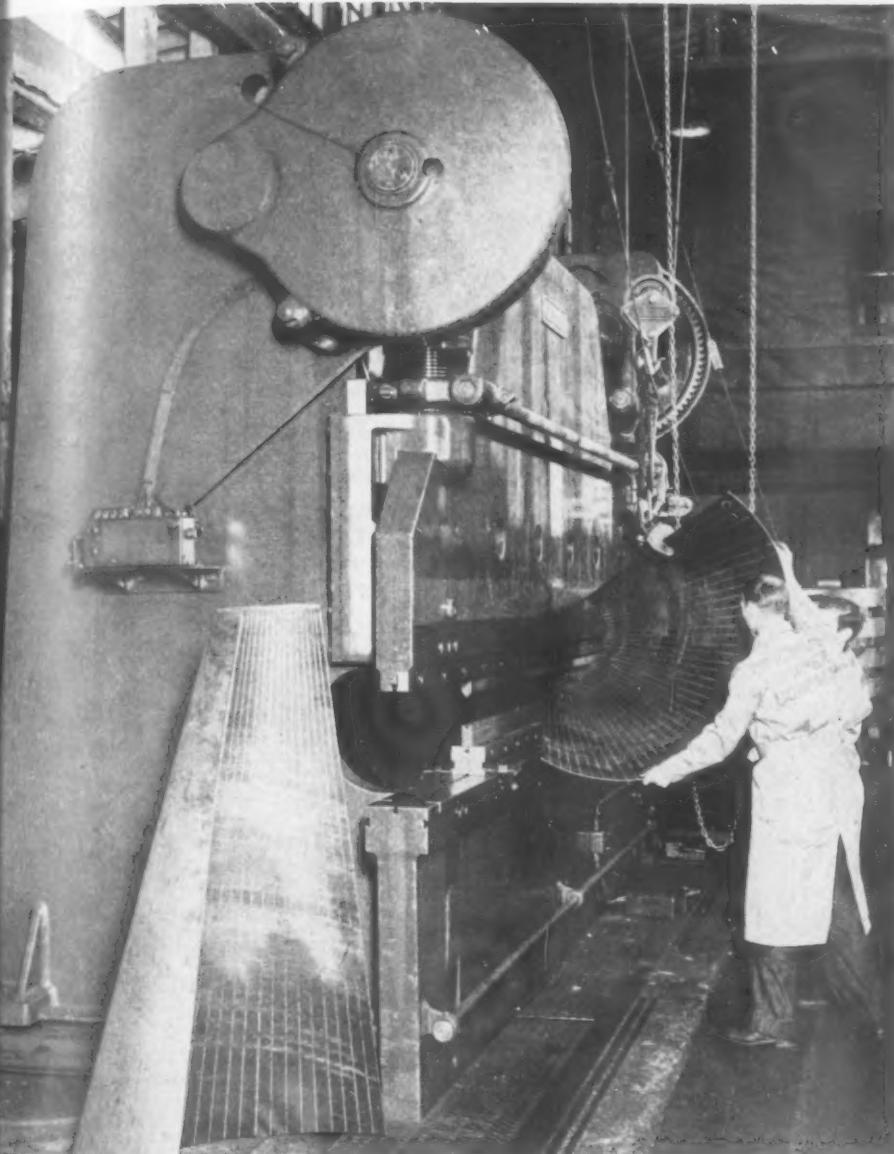
CONTINENTAL MACHINES, INC.

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Maryland, Indianapolis, Chicago, Milwaukee, Minneapolis, New Haven, New York, Cleveland, Philadelphia, Pittsburgh, Boston, Birmingham, St. Louis, San Francisco, Seattle, Tulsa.

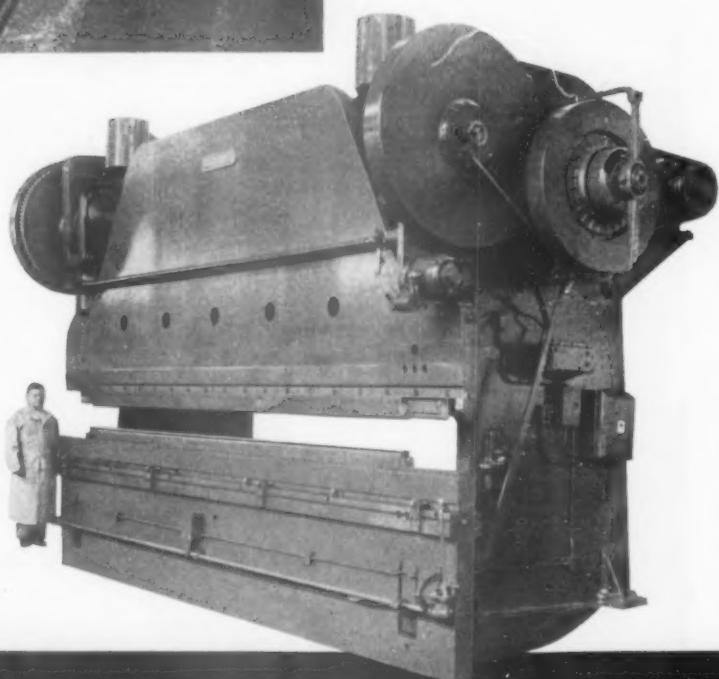
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...and CONE FORMING too!

From flat sheet to cone with standard dies . . . illustrates another job and suggests the surprising variety of work performed on Cincinnati Press Brakes.

Write our Engineering Department. They can solve your problems on forming cones and fadeouts, on curving, and many other operations. Ask for Catalog B-2.



THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

YOU CAN'T STRIP THREADS WITH THE

LINERMONT ROTO-TORQUE

**Won't Over-tighten • Saves
Screws, Nuts and Bolts.
Standardizes Assembly**



Now when you tighten your job is finished... no over-tightening or under-tightening... great assembly results... prevents stripped threads.

Linermont tools... built to last... built to do the job... built to save time and money.

Linermont tools... built to last... built to do the job... built to save time and money.

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INDUSTRIAL NEWS DIGEST

(Continued from page 116)

makes it virtually impossible to meet originally scheduled production requirements, it was stated. In this connection, industry representatives pointed out that substantial inventories are carried by the 1,600 distributors in the United States. From their supplies, it was believed, a large percentage of the U. S. armed forces requirements could be met.

Detailed reports on the carbon tap and die output capacities of the various producers are being given individually to the WPB, it was reported, after which a new production schedule will be worked out.

AIRCRAFT PRODUCTION

Boeing, Douglas, Lockheed Set Record With Team Play

LOS ANGELES—Spotlighting one of the most successful war production "pools" in industrial history, delivery of the 10,000th Flying Fortress was announced here by the Aircraft War Production Council on behalf of Boeing, Douglas and Lockheed.

On October 9, the AAF took delivery of Fort No. 9,999 from Douglas Aircraft Company in Long Beach, No. 10,000 from the Boeing Aircraft Company in Seattle and No. 10,001 from the Lockheed Aircraft Corporation in Burbank.

W. F. Peters, Manager, Aircraft War Production Council, observed that this production achievement "will go down in history as a symbol of American industry's resourcefulness and spirit of cooperation in the national emergency."

Of the 10,001 Boeing-designed Forts delivered since December 7, 1941, Boeing has built 6,143, Douglas has turned out 1,982, Lockheed another 1,876 ships.

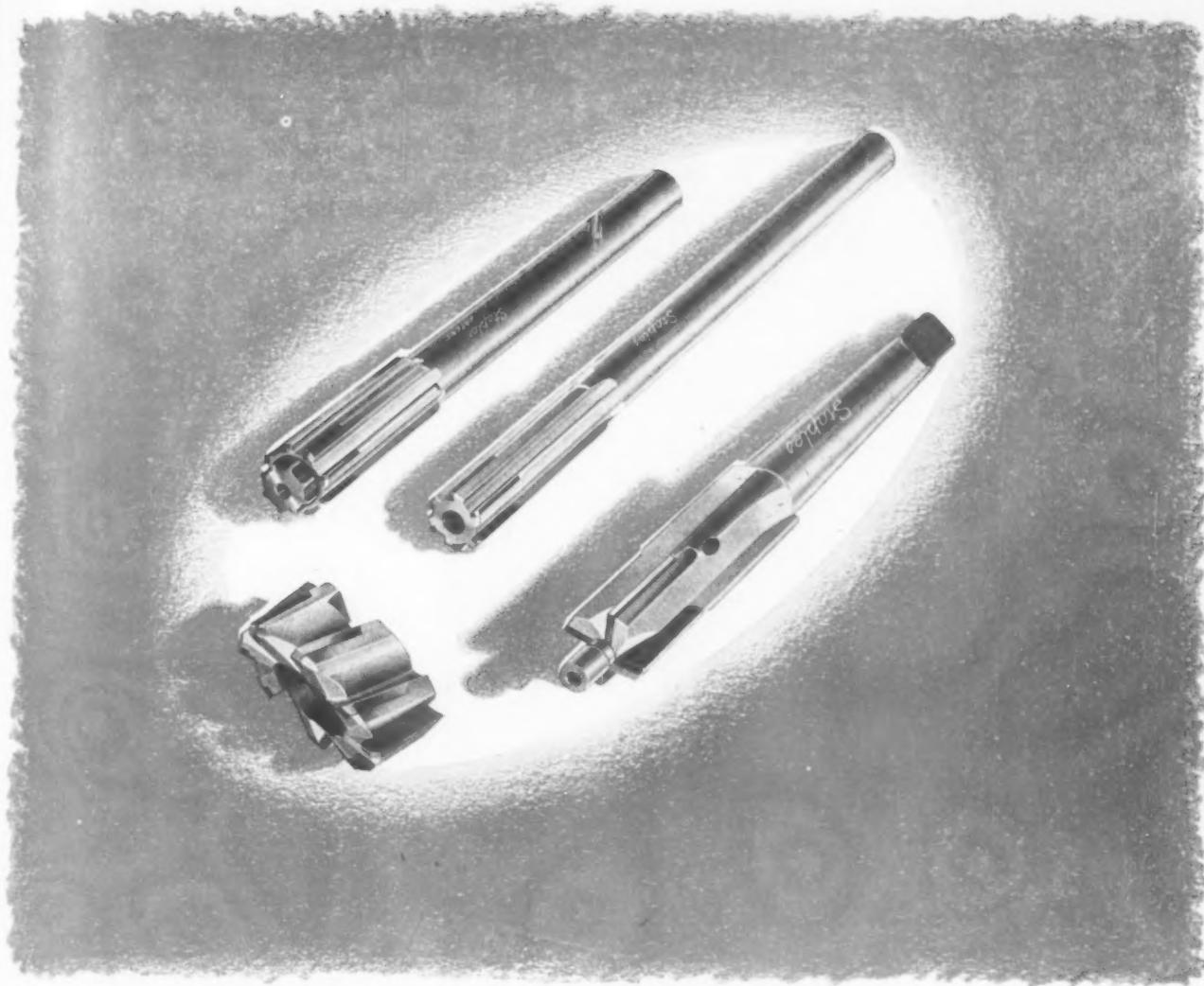
These three companies were brought together in May, 1941, in the production pool organized to meet the Army's need for the Flying Fortress.

Prior to this date, Boeing had been the sole producer of the plane, the first of which made its original flight in 1935. Under the pool arrangement, Boeing furnished its engineering data and production information to Douglas and Lockheed to facilitate their getting into immediate production. With the airplane to be built at three separate points and with hundreds of subcontractors and suppliers furnishing sub-assemblies and interchangeable parts, a central control organization for operation of the pool was a necessity.

This problem was solved by organization of the Boeing-Douglas-Lockheed B-17 Committee, made up of representatives of the Army and each of the three participating companies.

So successful was this plan that a similar one was set up when the Boeing B-29 Superfortress was thrown into a nation-wide production program with Boeing again furnishing engineering and production data to other firms for building its product.

(Continued on page 122)



NOW... AIRCRAFT ACCURACY IN CUTTING TOOLS... FOR ALL

Since Staples was founded most of its output of Carboloy-Tipped Circular Cutting Tools has gone into the building of aircraft engines. In fact, more Staples Carboloy-Tipped Reamers than all other makes combined are used by aircraft engine manufacturers.

Now, greatly increased production facilities make it possible for you to enjoy the benefits of these tools, made to meet the needs of aircraft accuracy. No matter what industries your

products serve, you can make use of today's highest quality cutting tools.

Our line of standard design tools is complete, but we will also make special design tools to your specifications.

Send for the most comprehensive information published on reamer usage and design, contained in our Catalog No. 44.

**STAPLES TOOL & ENGINEERING COMPANY
CINCINNATI 25, OHIO**

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS •
SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

DISTRIBUTORS: The Cameron & Barkley Co., Charleston, S. C.; Jacksonville, Fla.; Tampa, Fla.; Miami, Fla.; G. F. Cotter Supply Co., Houston, Texas; J. E. Dilworth Co., Memphis, Tenn.; The John C. Eide Co., Minneapolis, Minn.; Empire Machinery & Supply Corp., Norfolk, Va.; Fuchs Machinery & Supply Co., Omaha, Neb.; General Carbides Company, Newark, N. J.; Machinery Sales & Supply Co., Dallas, Texas; Marshall Supply & Equipment Co., Tulsa, Okla.; The Mine and Smelter Supply Co., Denver, Colo.; Murray-Baker-Frederic, Inc., New Orleans, La.; A. N. Nelson, Inc., Brooklyn, N. Y.; Sager-Spuck Supply Co., Inc., Albany, N. Y.; Screw Machine Supply Co., Chicago, Ill.; Strong, Carlisle & Hammond Co., Cleveland, Ohio; Syracuse Supply Co., Syracuse, N. Y.; Sterling Supply Co., Detroit, Mich.; Muskegon Hdwe. & Supply Co., Muskegon, Mich.; Harold W. Kimball Co., Waterville, Me.; White Supply Co., Waterbury, Conn.; J. E. Haile & Co., Portland Ore.; The L. A. Benson Co., Inc., Baltimore, Md.; El Paso Saw & Belting Co., El Paso, Texas; Quinn & Quinn, Birmingham, Ala.

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You, too, can eliminate file troubles . . . secure best results at least costs on your intricate and accurate filing work . . . by standardizing on "AMERICAN SWISS" Swiss-Pattern Files. The tough, strong metal . . . correct and uniform hardness . . . sharp, deeply cut teeth . . . long filing surface of these precision tools assure faster work, longer life, and lowest filing expense. Furthermore, the large "AMERICAN SWISS" line of more than 3000 different shapes, cuts, and sizes assures an exactly suitable selection for each job, and each file is guaranteed to be perfect in every respect. You are SAFE when you standardize on "AMERICAN SWISS" Files . . . obtainable from our Distributor.



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SWISS PATTERN FILES

INDUSTRIAL NEWS DIGEST
(Continued from page 120)

INDUSTRIAL BUSINESS NOTES

News of Industry Expansions, Services, and Activities

Radio: Rack up another big name manufacturer for home radio receiving sets. Bendix Aviation Corporation has a Radio Division to manufacture and market home receivers come B-for-build-day. The firm is already rated among the top in production of precision radio, radar and communications equipment for military use.

"Our decision to enter the home radio field is in line with the company's policy to manufacture certain consumer products which will represent real contributions to the American public in point of engineering advancement and at prices made possible by low-cost production methods", said Ernest R. Breech, President.

W. P. Hilliard is General Manager of the Radio Division. He is directing establishment of distribution and sales channels.

Clutches: Assets of L. G. S. Spring Clutches, Inc., have been acquired by a subsidiary of Curtiss-Wright Corporation, according to W. C. Starkey, who started the firm in 1925. G. W. Vaughn, President of Curtiss-Wright, announces the firm will continue spring clutch manufacturing in Indianapolis without major changes in personnel. Direction was handed to E. F. Theis who will be President. He also manages the Indianapolis Curtiss-Wright plant.

Canteens: Recognition of in-plant feeding as a stimulus to war production makes available material for mobile canteens, according to S. Blickman, Inc., manufacturers of food service equipment. Mobile "pie wagons" take food to the worker under proper temperature controls for palatability and nutrition.

Contract: John A. Johnson & Sons, Inc., has been awarded general contract to construct a subsidiary plant of The Goodyear Tire & Rubber Company at Topeka, Kansas. The installation will build tires of large dimension for military use.

The plant is scheduled to begin operation January 1, 1945, according to P. W. Litchfield, Goodyear Chairman of the Board. It will employ an estimated 400.

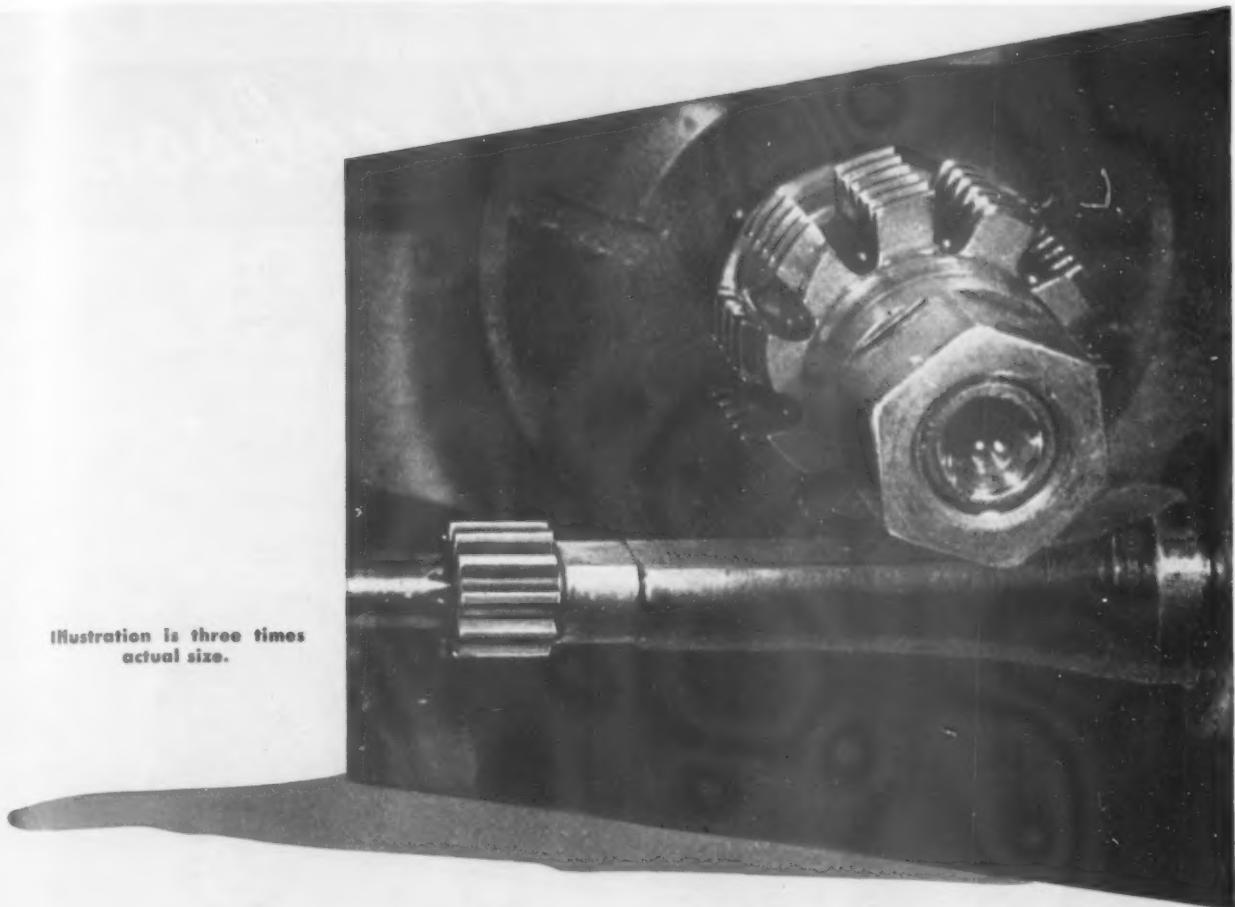
W. D. La Due of the Goodyear engineering staff will be Resident Engineer. J. Gordon Turnbull, Inc., is consulting engineer.

"E" Flag: Norton Pike Company flies the Army-Navy "E" flag. Presentation was by New Hampshire Governor Robert O. Blood. The firm is a division of Norton Company and has manufactured oilstones and abrasive specialties since 1823, first as Pike, now as Norton.

Service: Howell G. Macduff announces opening of a sales and service office for representing prominent firms to New England users.

(Continued on page 126)

Illustration is three times
actual size.



200 fine pitch GEARS PER HOUR
~~with 2000 gears per hob sharpening~~

That's the sort of job Michigan fine-pitch ground hobs are designed to do. The gears are 48 pitch with 10 teeth, 7/32" long and an O.D. of 0.250 inch. Feed is automatic. On hand fed machines in the same plant, 50 steel gears per hour are being turned out with 750 gears per sharpening of the ground hob. The latter are 11 tooth, 48 pitch with an O.D. of 0.270. Both are used in supercharger controls.

Michigan fine-pitch hobs are available in ground form up to 48 pitch. Unground types can be furnished up to 96 pitch.

Where extreme precision is required, fine-pitch hobs for small gears can be furnished in pre-shave types, to enable finishing to almost any accuracy desired on Michigan 861-4B gear finishers.

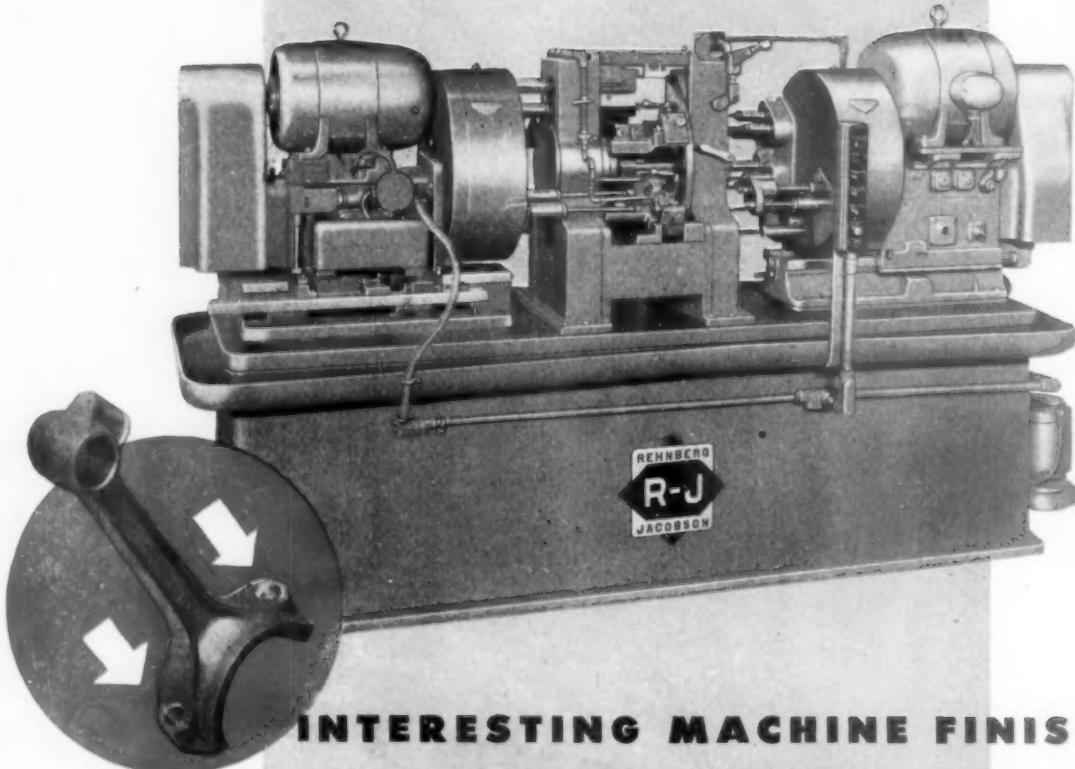
We will be glad to quote you on your requirements.



MICHIGAN TOOL COMPANY
7171 E. McNICHOLS ROAD • DETROIT 12, U. S. A.



Rehnberg-Jacobson



INTERESTING MACHINE FINISHES CAP BOLT HOLES IN AUTO CONNECTING ROD

The left-hand head end mills to the broached surfaces at station 2 and combination finish counterbores and chambers at station 6. The right-hand head drills 2 holes half-way at 2, drills through at 3, rough reams at 4 and finish reams at 5. Station 1 is for loading and unloading. W. F. and John Barnes units are used with heads of our own design and manufacture. Since production requirements are moderate, index is manual but with a safety latch to prevent back motion or double indexing and to provide an approximate stop. End milling is off center for tool efficiency and to give a smooth surface for the drill break-through. Reamer feeds are compounded to give them twice the travel of the drills. This all adds up to a simple, efficient machine for doing a tricky job effectively.

This is
a good example
of ingenuity, simplicity,
and manufacturing skill
typical of Rehnberg-Jacobson
machines. Take advantage
of our experience in
planning your future
production
lines.



REHNBERG-JACOBSON MANUFACTURING CO.
Special Machinery

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I never knew what Carbide
could do, until I used
TECO Cemented Carbide

- More pieces between grinds
- More grinds per tool
- Less down time
- Lower tool cost

Many a production man who was "satisfied" with his carbide tools has changed his mind when he changed to TECO Cemented Carbide. This harder, denser, more uniform carbide outproduces other carbides in job-for-job comparisons.

Prove it yourself! Put TECO Carbide Tools on any machine in place of present carbide tools. This simple change will produce more pieces between grinds—give more grinds per tool.

One of our tool engineers will be glad to study your needs and suggest the most suitable TECO tools and operating procedure. Meanwhile, send for complete catalog and price list.



TUNGSTEN ELECTRIC CORPORATION 570 39th Street, Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representatives: Indianapolis, Ind. Chicago, Ill. Detroit, Mich.

IMMEDIATE DELIVERY
FROM STOCK

can be made on
most standard
TECO Cemented
Carbide Tools and
Blanks!

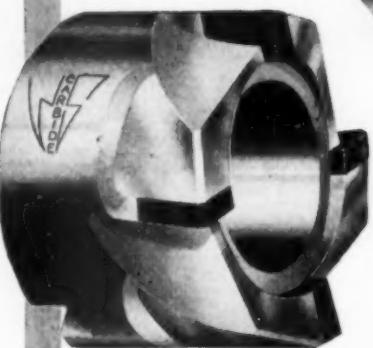
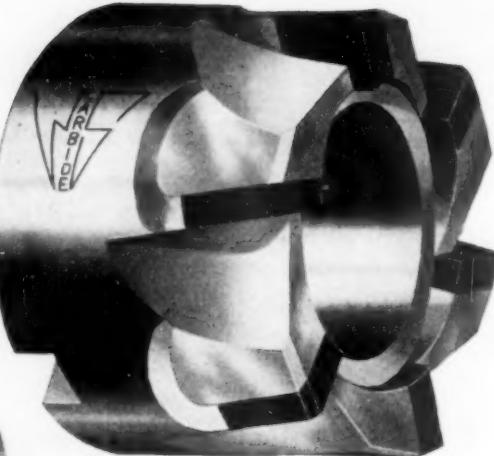


Pioneers in Tungsten Carbides
for over a Quarter Century



CEMENTED CARBIDE

No. SSM Shell End Mills, for machining steel. Standard sizes from $1\frac{1}{4}$ " to 6" diameters, 4 to 10 teeth.



Boost output

AS MUCH AS

10 times

...with these new

STANDARD CARBIDE TIPPED SHELL END MILLS

UP TO 10 TIMES greater output and 4 times longer life between sharpenings, are not unusual with these new Wendt-Sonis Carbide Tipped Shell End Mills that employ a negative rake design feature. Consider these desirable advantages:

1. 20" feed compared to a 2" feed of HSS end mill
2. Increased surface feet per minute
3. 25% longer carbide tips
4. Faster, cleaner cutting . . . finer finishes

Carbide Tipped Tools are a specialty with us. We make them exclusively. Our experience, research, development and improvements are your assurance of complete satisfaction when you use W-S Carbide Tipped Tools.

Refer to "TOOLS" in your Classified Telephone Directory, for your nearest W-S Distributor, or write WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Branch Warehouse: LONG BEACH, CALIFORNIA.

NEW!

CATALOG 144 just off the press. Contains data and latest prices on W-S Shell End Mills plus many standardized carbide-tipped tools formerly classed as "special." WRITE TODAY for your FREE copy.



WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF
TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING
CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

INDUSTRIAL NEWS DIGEST (Continued from page 122)

Contract: Anderson Machine Tool Company, St. Paul, Minn., has contracted as special distributor of TOCCO Process Induction equipment according to William C. Dunn, Ohio Crank-shaft Company President. This is the tenth distributor to be given a sales contract.

Electronics: Western Electric Company has leased the Lane Bryant Building in New York City for manufacture of electronic equipment for military use. Full production is expected late this year. Henry F. Snyder has been appointed Plant Superintendent.

Steel: Bliss & Laughlin, Inc., has named Walter A. Fairchild to open a sales office in Hartford, Conn. to provide better service in distribution of their cold finished steel products.

Expansion: American Can Company awaits availability of men and materials to start work on their \$6,500,000 plant on a 49-acre site in St. Paul, Minn., according to Gordon H. Kellogg, Vice President. The plant is expected to employ 1000, twice the number now on the payroll at St. Paul.

Gages: Warren Industries, Warren, Mich., announces addition of precision gages to their lines. Spline gages and indexing fixtures will be included as well as the usual classes of gages.

Anniversary: Wright Aeronautical Corporation calls attention to its Twenty-Fifth Anniversary in a novel fashion. The firm circulated cards inviting friends to a Silver Anniversary "celebration to be announced after the cessation of hostilities."

Purchaser: Lempco Products, Inc., Bedford, Ohio, announces purchase of the Cleveland Pressed Steel Company. Lempco awaits availability of building materials to expand plant facilities for manufacture of consumer goods developed during three years of experiment.

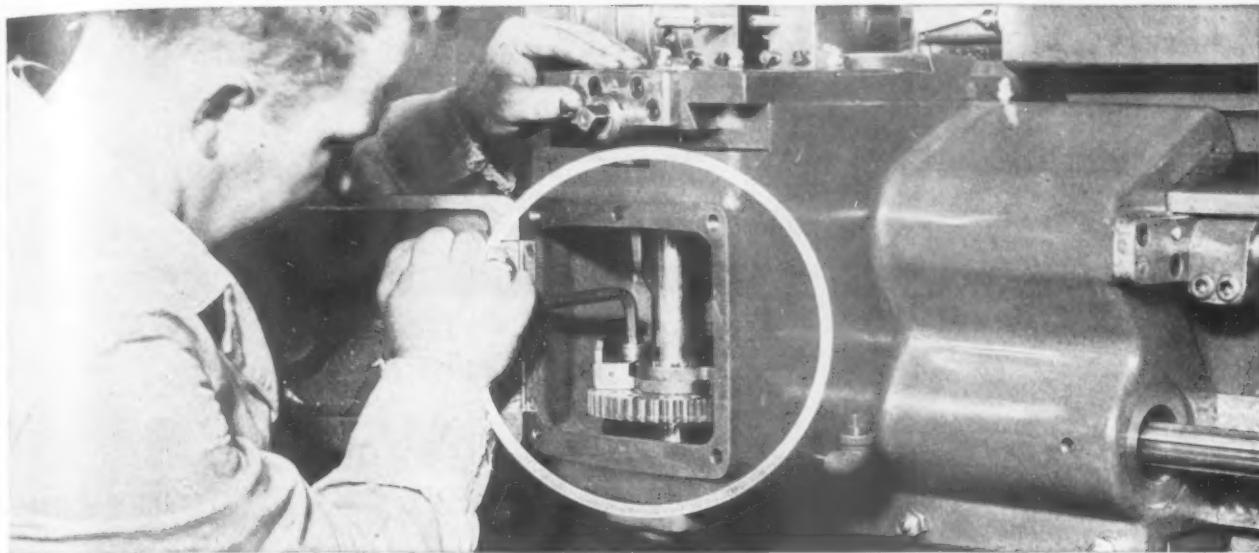
Conversion: General Electric's second largest wartime plant is being converted for production of jet propulsion aircraft turbines. The product formerly manufactured at the site is no longer required by allied forces. G.E. has aided in development of this startling offspring of Brothers Wright, Galileo and Newton, and is prepared to produce them in large numbers. A second large corporation has received technical assistance in conversion of similar property to jet propulsion turbines.

Distributor: George Keller Machinery Company announces its appointment as exclusive distributor for Norton Machines in the Buffalo territory.

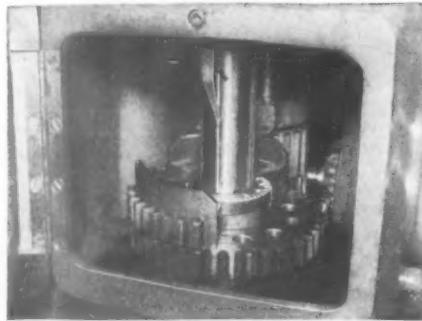
Relocation: The DoAll Trade School, formerly in Minneapolis, has been moved to newer and larger quarters in Des Plaines, a Chicago suburb.

THE END

ONLY Lo-swing AUTOMATIC LATHES



HAVE THIS Quick Change-Over Mechanism

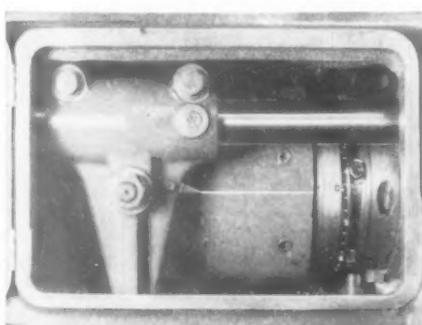


Close-up view of Simplified Change-Over Mechanism.

● War production plants appreciate the speed and simplicity with which Lo-swing Automatic Lathes can be changed-over from job to job. Take Model LR for example: A hinged door provides easy access to the Simplified Change-Over Mechanism located on carriage front. Simply loosen two cap screws and move gear segment to graduation on scale corresponding to desired length of cut in inches. Tighten cap screws and carriage is timed for the job at hand. Cam is standard and does not have to be changed, and since the cycle is closed and locked, machine cannot get out of time.

Rapid traverse adjustment is accomplished with equal ease and speed thru the hinged door at the head end of machine. Loosen two cap screws and slide the ring which is graduated in inches around until the length of cut desired in inches is opposite the zero mark. This automatically positions the rapid traverse control cams so that the remainder of the cycle is completed in rapid traverse. A Rapid Traverse Control Handle, conveniently located just below the door opening, further facilitates this adjustment and reduces change-over time.

These and other Lo-swing features, developed in the peace-time past, are proving their value under the stress of war production.

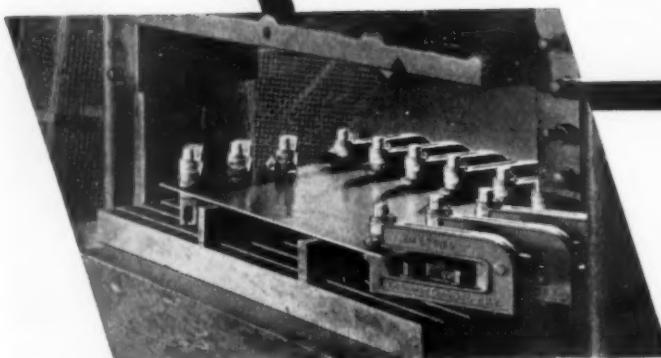


Close-up view of drum cam showing index line and graduated adjustment ring.

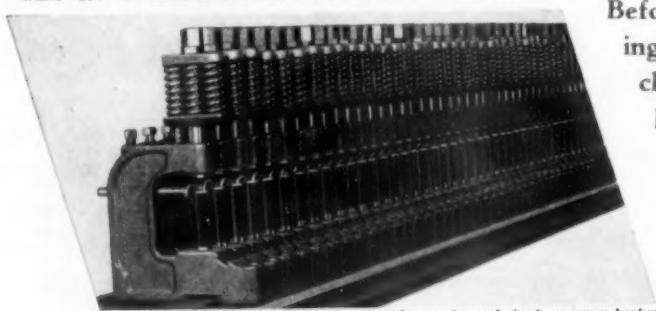
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from **SENECA FALLS**

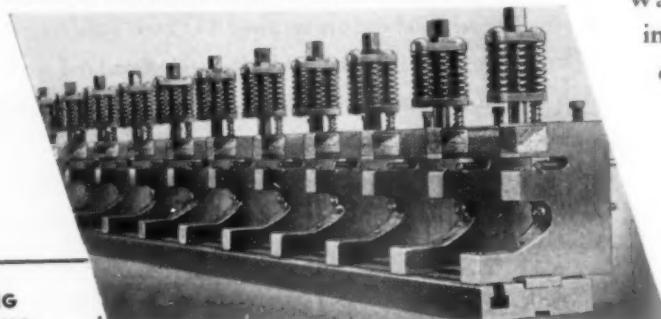
BEFORE YOU PUT HOLES IN SHEETS ANGLES CHANNELS



Wales Type "B" Units for punching sheet material in stamping presses



Wales Type "C" Units designed for punching angles and sheets on press brakes



Wales Type "E" Units to punch extruded shapes and channels on press brakes

TIME-SAVING MONEY-SAVING FEATURES

1. Usual time-consuming adjustments of conventional set-ups are eliminated
2. Punch and die held in perfect alignment by holder
3. Each unit is independent and self-contained
4. Straight line, staggered or scattered patterns, punched with same units
5. Same group of units may be used interchangeably on press brakes and stamping presses
6. Nothing attached to press ram
7. Individual units may be instantly removed or reset
8. Punches may be interchanged without disturbing set-up
9. Die setting and press "down time" reduced to minutes
10. Same units may be used and re-used in unlimited patterns

BY any METHOD... investigate

WALES HOLE PUNCHING EQUIPMENT

Before spending valuable time and effort designing and building special hole punching dies, check with Wales-Strippit engineers who may have solved your particular hole punching problems by using various adaptations of standard Wales Hole Punching Units.

Join the hundreds of metal fabricators who make it a rule to call on Wales-Strippit *before* putting holes in sheets, channels, and angles by any method.

As a timely suggestion, call on Wales-Strippit *FIRST*.

•
Write for Catalogs
•

WALES - STRIPPIT CORPORATION

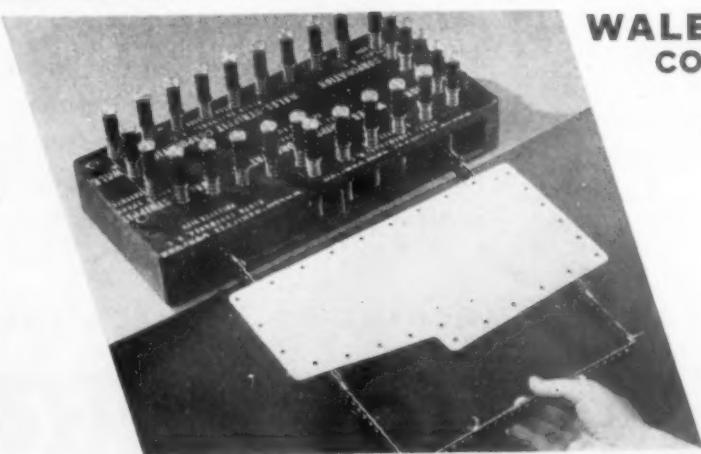
353 Payne Avenue

NORTH TONAWANDA
N. Y.

(Between Buffalo and
Niagara Falls)

GEORGE F. WALES,
President

Specialists in Punching
and Notching
Equipment



Wales Plate Set System punches holes in sheets as close as $\frac{1}{2}$ " center-to-center in any direction over the entire sheet.

THE TOOL ENGINEER



NATCO ADJUSTABLE SPINDLE WAY-TYPE MACHINE

APPLIED TO
HEAVY-DUTY WORK

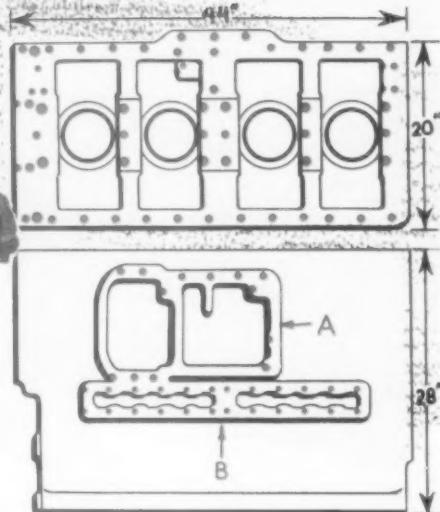
THIS heavy-duty two-way NATCO drills 99 holes simultaneously in a 750-lb. Diesel cylinder block. A rearrangement of the spindles in the slip-spindle plate quickly adapts the machine to a change in the design of the part.

The machine consists of standardized HOLESTEEL units mounted integrally with a stationary central fixture. A cylinder block is loaded upon a roller conveyor in the fixture and then jacked up against the finished bottom face, being located over two master dowel holes.

SPEED, PRECISION, ECONOMY

NATCO way-type machines are built for specific jobs to process multiple holes automatically, thereby increasing production and reducing hole costs. Accurate work is assured because the "skill is built into the machine" and the opportunity for human error is held to a minimum.

You are invited to send us your blueprints or have our field engineers make a survey of your requirements.



The above diagrams show the holes drilled in the cylinder block.

Vertical unit drills 62 holes in the bottom of the block including all cam and bearing stud holes, also six oil lead holes 5" deep.

Angular right-hand unit drills a total of 37 holes, 13 of which are in pad A and 24 in pad B.

All operations are automatic from a push-button start.

Production, 19 blocks per hr.

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND.
MULTIPLE DRILLING, BORING, AND TAPPING MACHINES
INVESTIGATE NATCO METHODS FOR THE LOWEST POSSIBLE HOLE COSTS!

SALES OFFICES: 1809 ENGINEERING BLDG., CHICAGO; 409 NEW CENTER BLDG., DETROIT;
1807 ELMWOOD AVE., BUFFALO; 2902 COMMERCE BLDG., NEW YORK CITY.



*and You'll Want
No Other!*

A broad statement? Yes. But soundly founded on facts—the experience of numerous large manufacturers — the actual performance records of the machines, themselves — and fundamental superiorities of design and construction.

Larger wheels (24" diameter on the standard models) provide greater traction, faster, straighter cutting, more production. Transmissions, common source of die saw grief, never fail in TANNEWITZ DI-SAWS.

STANDARD MODEL No. M24
(24" WHEELS)

Sturdier, heavier construction throughout, plus many refinements of design, make these machines the greatest, trouble-free producers in their field. It pays to buy the best!

With a TANNEWITZ DIE-SAW you can do in minutes jobs which require hours by the shaper, miller or lathe methods.

Get the complete facts. Just write for DI-SAW bulletin.

Other Models to Handle Work of Practically Any Size

Made with 30", 36", 48" and even larger throat capacities if desired, the TANNEWITZ "Big Bertha" models make available the tremendous savings of inside and outside sawing, filing and polishing on dies, jigs and other work of practically any size. Write for bulletin.

On request: Bulletins on Single and Variable Speed Foundry Band Saws; Sheet Metal Cutting Band Saws.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

SURPLUS POLICY CHARTED

(Concluded from page 109)

costs by maximum utilization of the best machine tool equipment available," Bailey said.

"Our industry can't build enough new machine tools fast enough to do this job. And we should not be asked to build them in large quantities when we have already produced the machines that can do the work.

"The best solution, as I see it," Bailey said, "is for the factories of the United States to throw old machine tools out, bring in all the war-built machine tools, use them to the best possible advantage in the intermediate conversion period, and then later install our real postwar models, as fast as we can develop them, perfect them, and put them on the market."

BERNA CREDITED FOR JOB

Further indication that this will be the industry policy on surplus machine tools was the Association Planning Committee Report delivered by William P. Kirk, Vice President, Pratt & Whitney. Kirk in revealing the disposal policy submitted by his Committee to Washington, covered the same ground previously explored in the Bailey report.

The importance of the Washington scene to the machine tool industry was emphasized by A. G. Bryant, Vice President, Cleerman Machine Tool Company, who delivered the Government Relations Committee Report.

Bryant's citation of work performed, by Association General Manager Tell Berna, in awakening government to the vital role of this industry in the nation's economy, received unanimous approval of the builders.

GM WANTS ACTION ON ORDERS

Most controversial talk was that by John S. Chaffee, WPB Machine Tool Director. Necessarily forced by the government's niggardly press policy to speak "off the record", Chaffee's remarks immediately became the chief topic of discussion throughout the palatial Homestead Hotel.

Builders said they were encouraged by Chaffee's insistence that the auto industry's need for 7,000 critical machines is receiving sympathetic attention from top WPB officials. When Chaffee was cornered later by General Motor's machine tool sharpshooter, Standards Director Harold Johnson, he backed for cover with the remark that "this problem can't be solved by shouting at each other."

B. D. Kunkle, GM Vice President, said the corporation sent 7,767 of its 88,000 pre-war machines to other war industries, must replace at least half of them to undertake auto production.

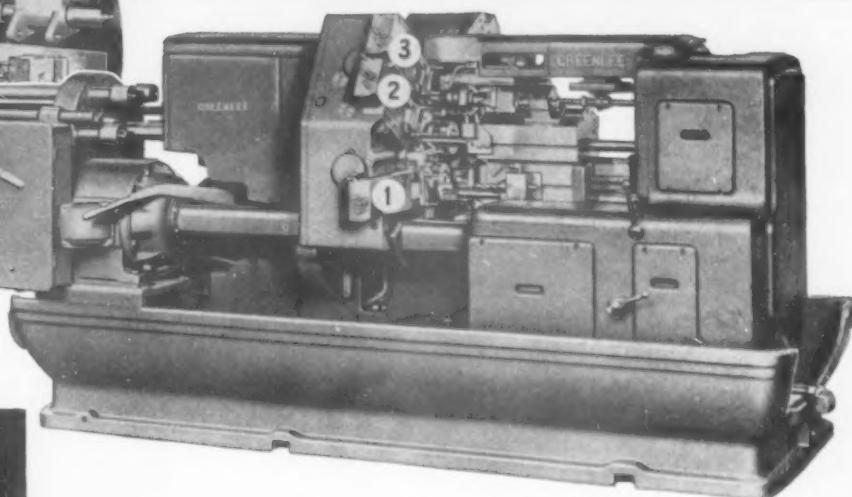
The WPB machine tool man did warn the builders that the government expects them to complete by next June 30, the \$120,000,000 in Russian orders they have on their books. Until these orders are filled, Chaffee was understood to have said, the builders can't look for a real "go-ahead sign" on civilian orders. Not surprising was Chaffee's denial of the current charge that many "foreign" orders are not "war" orders, but peacetime orders.

THE END
THE TOOL ENGINEER

From Golf Pro to Screw Machine Operator



Above—Barney Barenbrugge, *Golf "Pro"*, operating Greenlee Six. View shows tapping attachment in No. 3 position which permits dual production on parts below.



These three aluminum couplings, vital in aircraft use, are produced on a $1\frac{1}{2}$ " capacity Greenlee Six. The machine is toolled with a dual set-up... two parts are produced simultaneously.

The following tooling set-up, used by Chicago Metal Hose Corp. to produce couplings, illustrates the easy application of tools on a Greenlee Six.

SEQUENCE OF OPERATIONS

1st Position

Form two pieces.
Drill small hole for
two pieces.

2nd Position

Knurl two pieces.
Tap drill 1st piece.

3rd Position

Tap 1st piece.
Cut off 1st piece.

4th Position

Tap drill 2nd piece.

5th Position

Tap 2nd piece.

6th Position

Cut off 2nd piece.

Machine equipped with lead screw for precision threading and tapping. Large part run at 900 R.P.M.; small parts 1100-1300 R.P.M.

NOTE: Free reprints of this ad are available to companies wishing them for labor recruitment, etc.

ON A GREENLEE 6-SPINDLE AUTOMATIC

★ For thirteen years, Barney Barenbrugge, professional, plied his woods and irons over the fairways to master the game called golf. But, today, like other Americans, he's busy with another profession — helping Uncle Sam win a war!

Fifteen months ago, he was assigned to the job of running Greenlee 6-Spindle Automatics in the plant of Chicago Metal Hose Corporation. He'd had no previous machine experience. Before Pearl Harbor he had never worked in a shop.

But, with thoroughness, he applied himself to this new study of angles, timing and rhythm. He learned rapidly — found his new job interesting. Step by step he studied the fundamentals. Soon, he was able to make tooling changes and precision adjustments, quickly and easily. Today, he operates a Greenlee with the proficiency of a production professional.

Today, with a trade as well as a profession, he aids his Company and his Country to "back the attack." He is producing, on the Greenlee, thousands of precision parts that are machined right to reach the fight. Three of these parts, each produced *two at a time* on a dual set-up, are shown above.

For detailed facts on features of Greenlee 6, write



GREENLEE BROS. & CO.
1951 MASON AVE., ROCKFORD, ILLINOIS

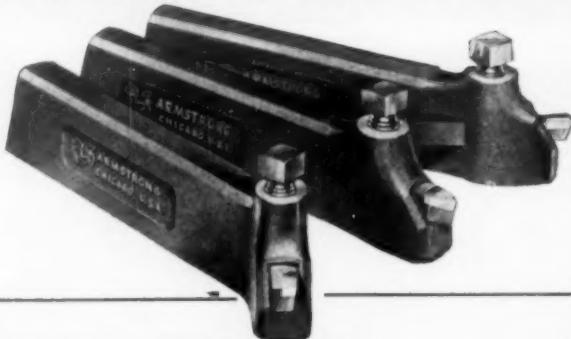
GREENLEE

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

ARMSTRONG

Carbide

TOOL HOLDERS



Each Takes Carbide Tipped Cutters of Many Shapes

ARMSTRONG Carbide TOOLHOLDERS have been specially designed and engineered for use with Carbide-tipped tool bits, and embody the special characteristics essential for the efficient use of carbide-tipped cutters, namely; great strength, extreme rigidity and close-up support for the cutting edge, and a "flat" cutting angle. They are drop forged from a special analysis steel. They differ from the universally used ARMSTRONG TURNING TOOL HOLDERS for ordinary high speed steel cutters, in the following details: (1st) they are heavier, size for size—are wider and less shaped at the "neck". (2nd) They are extended far forward under the cutter to give close-up support to the cutting edge. (3rd) They hold tipped tool bits at a "flat" angle parallel to the shank (instead of the $1\frac{1}{2}^{\circ}$ angle standard for high speed steel cutters). This reduces the end clearance requirements (necessary back rake) so that cutters need to be ground back but slightly, under the cutting point. (4th) They are available in various sizes with optional broachings—either for "Square Shank" or "Heavy Duty Shank", AR-MIDE or other carbide-tipped tool bits.

Each ARMSTRONG Carbide TOOL HOLDER is a permanent, multi-purpose tool. Each takes Armide or other carbide-tipped tool bits ground to innumerable different cutter shapes. Hence, each does the work of a complete set of solid carbide-tipped tools. Coming in many sizes, all taking interchangeable standard carbide-tipped tool bits, which are now stocked in several cutter forms by all leading industrial supply houses, they provide a complete "System of Carbide Tools" which are readily obtainable at nominal cost. . . . a system of tools which makes practical the use of carbide tools for every day work in the average tool room, maintenance department or machine shop.

ARMIDE
Carbide-Tipped Cutters come in two grades and four standard shapes with square or "Heavy Duty" shanks.



Write For
ARMSTRONG-ARMIDE
Bulletin

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People" 360 N. Francisco Ave., Chicago, U.S.A.
Eastern Warehouse & Sales: 199 Lafayette St., New York

ZING! ZIP!

AND THE METAL IS CUT!



It's as easy as that when you cut with this new DeWalt High-Speed Metal Cutting Machine

This new, high-speed DeWalt will out-perform the ordinary types of "light metal" cutting machines you have heretofore been able to buy to do comparable work. It cuts metal fast, accurately, and with greater safety. *And it's built to last.*

One manufacturer, who has a battery of these high-speed DeWalts, is cutting S. A. E. 52100 solid bearing steel into $15\frac{1}{16}$ " lengths—at the rate of 600 to 650 pieces per hour per machine, using women operators. The machines have already cut 4,500,000 pieces and are still going strong.

DeWalt engineering service helped this customer step up service. What is your metal cutting problem? We manufacture a complete line of metal cutting machines, and may be able to help you. Call in one of our engineers. Wire, write or phone DeWalt Products Corporation, 6107 Fountain Avenue, Lancaster, Pennsylvania.

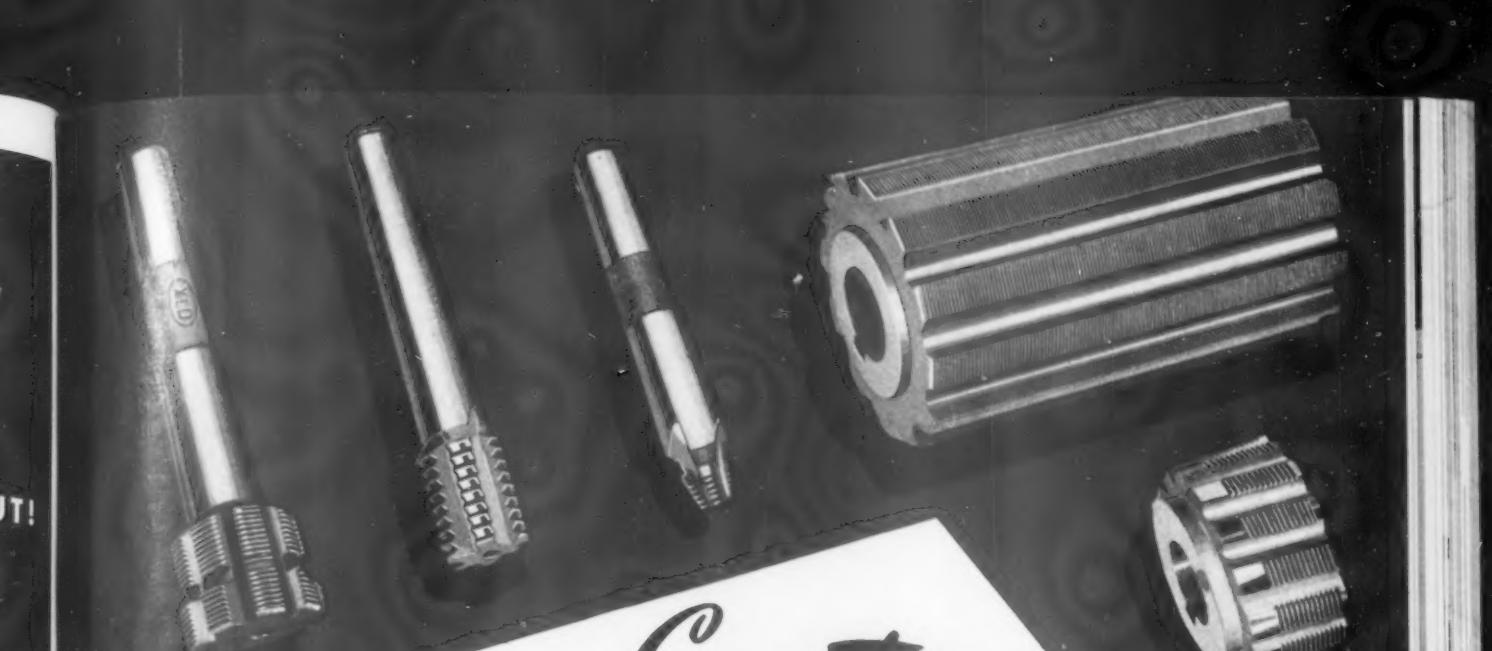
DE WALT

LANCASTER,

RADIAL
POWER SAWS

PENNA.

THE TOOL ENGINEER



Greater ACCURACY REQUIRED

New Production Speeds and Improved Part Finish
Place Emphasis on PRECISION-MADE Cutting Tools



Since 1919 The Continental Tool Works (a division of Ex-Cell-O Corporation) has been producing special and semi-standard cutting tools to customers' drawings or part prints—until today the Continental name in the cutting tool field is commonly used as another word for "accuracy and quality." This long experience, coupled with the most modern and complete facilities, makes Continental the first choice as a cutting tool source for manufacturers planning their re-tooling for tomorrow's huge production. Find out now how you can be assured of high production efficiency—get in touch with the nearest Ex-Cell-O representative or write to Continental Tool Works Division, Ex-Cell-O Corporation, Detroit 6, Michigan.

EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPING MACHINES • BROACHES AND BROACH SHARPENING MACHINES • HYDRAULIC POWER UNITS GRINDING SPINDLES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • TOOL GRINDERS • FUEL INJECTION EQUIPMENT R. R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

Hone Machine Embodies Postwar Principles

DETROIT—That the machine tool industry eventually would introduce new designs to meet the challenge of postwar production has been a foregone conclusion. But when the first of such machines would be unveiled has been the topic of trade talk for months. Last month the first of such development models was introduced by Micromatic Hone Corporation, Detroit, at a special restricted showing.

"Industry has very largely won the war by tremendous increases in production. However, this has been accomplished because orders were to produce, regardless of cost. In postwar operation we are going to have to make better peacetime goods at lower costs and still pay high wartime—or even higher wages. This is industry's No. 1 problem," Kirke W. Connor, Micromatic President, told guests.

AID FOR PRODUCTION MEN

President Connor said the primary reason for revealing progress at this time was to assist production executives to plan for rapid conversion.

"Micromatic would be doing its customers a disservice if they held back these advances and did not make the knowledge of their existence available now. Ours is the first company to do this, we believe," Connor explained.

Among the exhibits of technical progress was the Micromold Abrasive Stick, an ingenious union of plastic, abrasive and steel. Micromatic has devised a process of imbedding abrasives in a thermosetting plastic to conserve abrasives, permit better control, and eliminate tool wear. Fourteen advantages are claimed. The stick is an integral part of a three-part work head which consists of tool, selective sizing ring disc, and the abrasive. The plastic holder permits use of the same range of abrasives as before. This tool has one-third of the usual number of parts in honing tools. The resulting lower cost permits purchase of additional tools for each job.

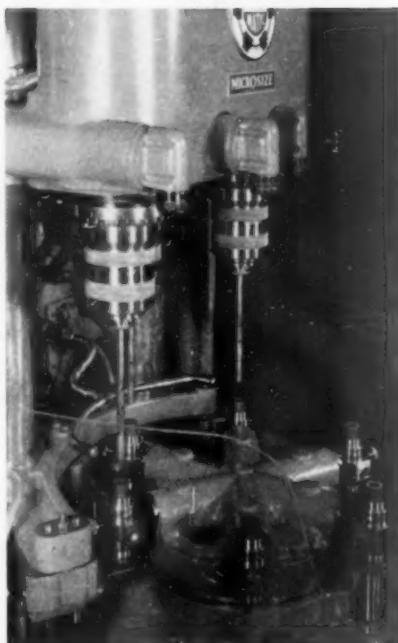
As the tool progresses in its work plastic tabs continuously enter the sizing disc. When the pre-determined amount of stock has been removed, the tabs automatically engage the disc, which in turn contacts a solenoid switch to shut off the tool. Size tolerances within .0003" are claimed.

The same arrangement has been applied to multiple spindle work heads, with each spindle having independent size control. This permits honing of holes with different variations of error. Each spindle will stop automatically at the pre-determined setting.

TOOLS EASILY CHANGED

Of particular interest to production men was the ease with which tools were changed. By use of a Briny bushing adaptor in the spindle nose, the tool can be taken out and replaced with simple half turns. This will permit operator to insert a tool quickly and continue work, while worn honing sticks are replaced by tool crib attendant.

"With this tool we have lifted honing



Here is the Microsize principle applied to a three-spindle hone. Each spindle is automatically controlled to stop when a predetermined size is reached.

from a finishing operation to a production process," Connor commented. "Microsize Control makes possible for the first time progressive honing because of individual control on each spindle as

SYRACUSE NEWS NOTES

(Concluded from page 104)

production facilities must do the job as well as they did for war. Failure to convert war production machinery to peacetime output rapidly and to turn out products at low selling prices will cause serious unemployment and immediate evaporation of potential post-war markets, he declared.

Coincidental with announcement of the 1945 Annual Meeting, to be held in Cleveland, March 19 to 22 inclusive, plans were revealed for holding a "Machine and Tool Progress Exposition". The display is scheduled to be held in the Cleveland Auditorium during the national meeting.

Pittsburgh was selected as the site of the next Semi-Annual Meeting, to be held in October 1945.

The Society's Organizational Progress Committee, under C. W. Briner, First Vice President, has been working for more than a year, it was announced in analyzing the constitution and by-laws. The committee report included recommendations for changes, which, if adopted, it was said, "would provide a constitution better integrated and better fitted as a basis of conducting Society business."

The Board of Directors endorsed the proposed changes and referred the pro-

posals to a membership vote.

Effective November 1, it was announced, the National Offices would be located at 1666 Penobscot Building, Detroit, "permitting greater work space and a chance to better organize the National Office setup."

The Executive Committee reported on work preparatory to undertaking the publication of an official Society organ, announcing that starting in February, 1945, it would publish its own magazine to be known as "The Tool Engineer".

CONVERSION UNIT SHOWN

Included in the show were many examples of external and internal honing operations. Among exhibits was the "package unit" which permits conversion of ordinary tools to take advantage of the new discoveries. This will permit manufacturers to obtain at least partially-increased efficiency if they have to use old equipment until they are able to obtain machines of latest design. Micromatic agrees the better course is to start with new equipment, but they realize they will be unable to supply the entire demand immediately. Also many manufacturers will unavoidably have to use present equipment to hasten conversion.

Use of the equipment has another advantage. Generation of a true bore, accurately sized, permits an I. D. reference from which to locate other dimensions. This principle supplants the practice of locating the I. D. from the O. D.

Advantages outlined by Micromatic include: (1) extreme accuracy at high speeds, fully controlled by automatic devices, (2) employment of unskilled help on highest precision work, (3) faster production of high precision parts, and (4) reduction of machine tool inventories.

KENNETH ALLEN

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Highlights of Standing Committee reports:

Publications: Many persons have been interviewed for position of Editor of the Society's proposed Handbook.

Education: Past President Otto Winter revealed encouraging responses from colleges to proposed plans for tool engineering courses.

Standards: Plans are being developed for the listing of speakers to circulate among the chapters, committee head L. G. Radermacher announced.

Membership: Chairman V. H. Ericson reported "improvements in quality of applications due largely to efforts of chapter membership committees."

Public Relations: Chairman G. J. Hawkey outlined a program for promoting news of the Society through the trade press and other media.

THE TOOL ENGINEER

Designed for Flexibility For Retooling



Four Way Machine

For drilling, rough and finish facing and tapping speedometer hole, tap size 13/16 diameter—20 threads per inch. Also drilling and tapping three holes 5/16-18 thread. The machine consists of the flexible Baker standard unit mounted around a five-station index table, 30 inch diameter. This method allows for chucking position where the case is loaded and unloaded to the front of machine convenient to operator. Units at the first three cutting stations are 5A12 self-contained hydraulic feed units for the drilling, boring and facing operations, the unit at the fourth station being multiple spindle tapper unit. All spindles in the tapper unit arranged with individual lead screw and nuts to each spindle, driven by a direct coupled motor with a reversing controller electrically controlled in the cycle of the machine.

This type of equipment is not only of high productive nature, but it is designed for flexibility for retooling. Units which are self-contained are mounted on the fabricated welded steel bed can be removed and used for building up of other types of multi-operation machines.



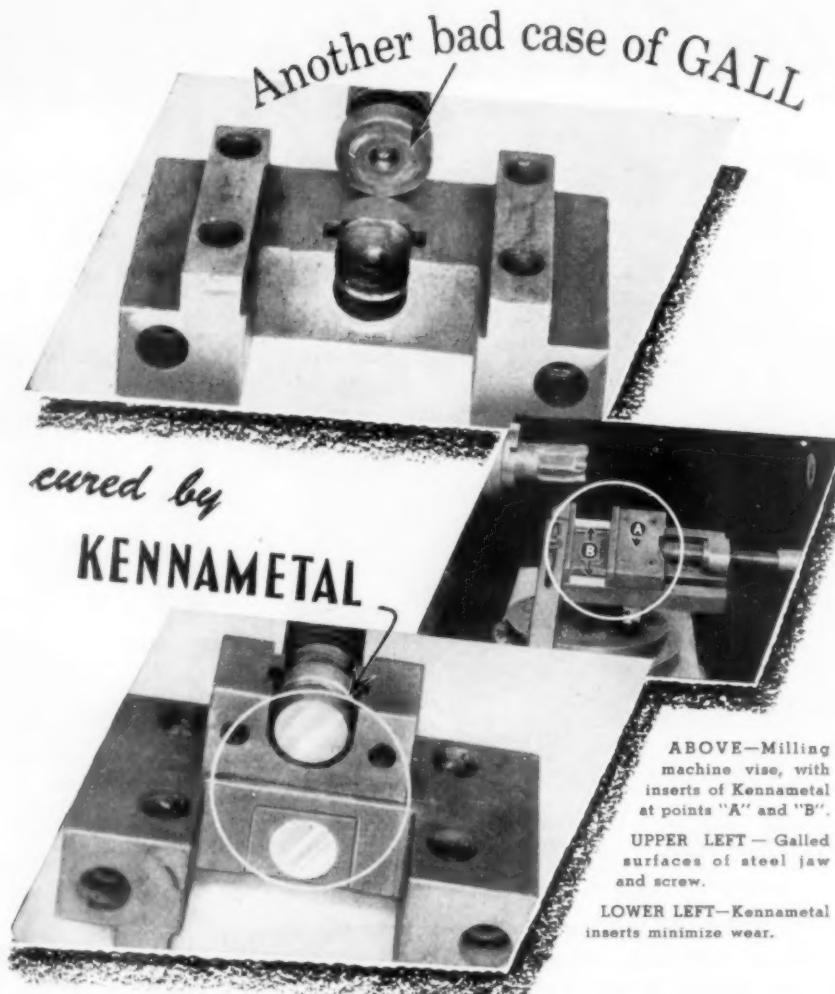
**DRILLING • BORING
TAPPING and CONTOUR
GRINDING MACHINES**

BAKER BROTHERS, INC.

P. O. BOX 101 • STATION F • TOLEDO 10, OHIO

NOVEMBER, 1944

135



The superiority of Kennametal for wear-resistant purposes is graphically demonstrated in this milling machine vise. The steel parts of the jaw and screw (enclosed in box "A") wore and tore under the twisting force exerted by the clamping mechanism. Thin discs of Kennametal—one brazed to the end of the screw, another recessed into the jaw at the abutting point—permit the jaw to be closed securely, and opened readily, with less effort. The performance of the vise has been further improved by inserts of Kennametal in the sliding surfaces on which the work rests, at points marked "B".

The high hardness of Kennametal (78 Rockwell C), and its unique non-galling property, provide resistance to abrasive wear that is up to 100 times that of steel. Kennametal's modulus of elasticity—2 to 3 times that of steel—minimizes possibility of deformation. Its unusual dimensional stability makes creep negligible.

Kennametal is available in a variety of standard shapes, or it can be furnished molded into almost any special form, limited only by reasonable proportions. We have supplied Kennametal . . . as accurately molded inserts for the customer to apply and grind as desired . . . mounted on parts furnished to us, and then finished by the customer or by us . . . embodied in elements or devices produced complete in our plant.

You can readily, and economically, incorporate Kennametal in the wear-areas of the machines you use, and the products you manufacture. Tell us your problem. We will suggest how Kennametal can solve it.



MACHINE TOOL BUILDERS FORESEE OPPORTUNITY

Continued from page 101

with a standard color. Deviation from that color, of course, resulted in additional costs in machine tool manufacture.

Collins expressed the consensus of opinion when he said that the machine tool user should paint his own machine if he wants it in special colors, because every user interested in vari-colored units has his own idea about those colors. It would be impossible to satisfy all demands without adding substantially to machine tool selling prices, he pointed out.

Generally, the Rockford builders felt the same way about building into their products special tool-point lighting. Because of the wide variety of general shop lighting in use today, the type and strength of lighting used on machine tools must be correlated to the type of illumination already installed in the shop, it was pointed out. All of the builders agreed with Olson's observation that it is impossible for the machine tool builder to meet such divergent demands in color and lighting on standard machines without adding to the selling price of the equipment.

INCREASED HORSEPOWER INDICATED

Utilization of increased horsepower in postwar machines is a foregone conclusion, the Rockford builders agreed.

"There is no question about it," Collins said. "We have got to provide more power and speed in all our machines, and they must be constructed to withstand the increased strains."

Olson declared that "the machine tool industry is facing quite a change from the standpoint of design after the war. Many of these changes will result from the apparent need for more speed and horsepower and, in turn, more sturdy and rigid machine units."

The introduction of carbides in metal-cutting, it was agreed, has posed many new design problems for the machine tool builder. The rising controversy of normal-speeds versus high-speeds likewise makes the builders design problem more difficult, it was reasoned by the Round-Table participants. Because of obvious market requirements, he must make his standard equipment applicable to a variety of operating conditions.

Yet, even in view of all these factors, Newton described the present situation as quite normal. "I think there has always been a contest between the machine tool builder on one hand, and the cutting tool designer on the other," he reasoned. "The next move is up to the builders."

WHAT ABOUT SPECIAL TYPES?

The builders warned against serious consideration of the popular conception of a big trend toward multiple-tooled, special purpose postwar machine tools. Such units will be built to meet the needs of extremely high production operations, it was agreed. But, they countered, such equipment is neither practical or required on the vast majority of operations. Even with rising labor costs, George Johnson explained, the choice of machine types used will

(Concluded on page 138)

WHY WE MAKE ONLY

Ground
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MILLING
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Only *ground-thread* milling cutters are made by Pipe Machinery Company—because *only* this type has maximum precision and accuracy to begin with, and *only* this type holds uniform accuracy throughout long runs of precision work.

Cost more? Yes, but they do better work.

PM Ground-Thread Cutters are made only on special order—each tool designed, engineered and built to fit the job.

Send us detailed information—we shall be glad to quote you prices and delivery dates.



The PIPE MACHINERY COMPANY Cleveland, O.

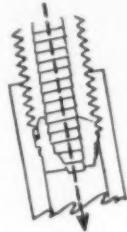
TAPPING TIPS*

From Woody Spencer's Notebook

ANOTHER AXIS WE'VE GOT TO STRAIGHTEN OUT



"An axis," says Webster, is a straight line, real or imaginary, passing through any body, on which that body revolves." Of course, there's one big Axis we all know about. And you know the kind of a job we've done on that! But the axis that runs down through our taps and holes is something else. Not getting it licked is the cause of a lot of tapping troubles such as over size, bell-mouth holes and the like. But when we indicate that axis, true it up and keep it true, we get straight, sure holes and precision threads. Just like licking the Berlin-Tokyo Axis, it takes a little time but the results are well worth it.



These "Tapping Tips" of Woody Spencer, are by no means intended as technical advice. Their purpose is to pass along short-cuts, shop ideas and time savers we hope will smooth out some of the routine jobs.

For the real tapping problems that come up with almost every job, be sure to get definite technical suggestions. Send us complete details (material, diameter, lubricant, depth, etc., etc.) Our engineers will gladly send you specific recommendations.

**Note: Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Watch for them.*

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company
Cleveland 3, Ohio



(Concluded from page 136)
depend upon "how much money you have to spend, and how long your average production runs are. Machine tools are always purchased on the basis of how much money they can save on a job."

POSTWAR MARKET UNCERTAIN

In a discussion of the postwar machine tool market, the builders admitted quite frankly that they can't estimate its size, or the effect that surplus war-built machine tools may have on the sale of new equipment. They certainly evidenced no interest in rebuilding their own machines that have been worn out on war work.

Collins summarized the sentiment on this question when he explained that "the machine tool builders should have postwar designs that are enough better, that produce so much more that users in most industries cannot afford to keep their old equipment or spend money on acquiring many of these surplus machines."

The Round-Table agreed with George Johnson that rebuilding worn special equipment is another matter. Obviously, he pointed out, single units in special setups will have to be rebuilt by the machine tool builder in many instances.

In the final analysis, Olson said, the smart machine tool builder faces the problems of postwar with only one factor in mind—the machine tool user.

"I always think of the statement attributed to John Wanamaker, the great merchant, 'The customer is always right.' Isn't it our job," Olson asked, "to keep our ears open to the customer's requirements, make suggestions, and then give the customer what he wants?"

THE END

TOOL ENGINEERS PREPARE

(Continued from page 104)

tures for magnesium, Wiberg said, "it should be remembered that tensile strength is about one-third that of steel, and wall sections are as thin as possible, to keep down weight. When using clamps for holding the parts in a fixture, the use of support pins is recommended to prevent chatter and distortion during machining.

"When gaging magnesium, the temperature of the part is of even greater importance than when gaging steel, because the coefficient of expansion is more than twice as great," he explained. "To assist in maintaining size on large castings, a thermostatically controlled heating element is installed in the head stock reservoir of turret lathes to keep the oil warm, which in turn heats the spindle and other parts of the headstock, as any fluctuation in temperature causes a marked rise or lowering of the height of the spindle from the bed."

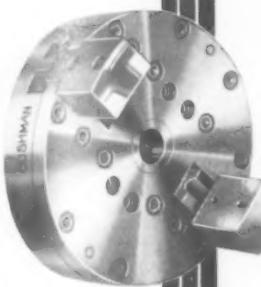
"In cases where no provision is made for heating the oil, the machine may be kept running to maintain its operating temperature, thus eliminating changes in size."

The background, wartime operation and postwar outlook of Canadian metalworking industry was covered in the session on "Operating a Branch Plant" (Continued on page 140)

THE TOOL ENGINEER

Today

THE KEYS TO VICTORY ARE BEING FASHIONED IN THE ACCURATE JAWS OF CUSHMAN CHUCKS



We say this, not in a spirit of claiming more than our small share in contribution to war production, but to again emphasize the importance of conserving, through efficient maintenance, every hour of productive service built into the chucks on your machine tools.

Eliminate time losses and work spoilage by constant check on your work-holding equipment. Select the right chuck for the job. Insist on proper lubrication . . . correct use . . . regular inspection for sustained accuracy . . . prompt repair or replacement when necessary. A supply of our "Chuck Check" cards . . . sent free on request . . . will help you. Write us.

Tomorrow

...THE KEYS TO BETTER JOBS AND BETTER LIVING

Reconversion is . . . we sincerely hope . . . not far away. Your chucks can play an important part in this program. By outlining NOW your needs for new chucks to replace those that will have exceeded their useful life in war production . . . by exploring the many possibilities in the use of new standard or special jaw equipment to save time in retooling . . . you can take one more practical step toward speeding your reconversion plans. We, at Cushman, have a wealth of experience we are ready and anxious to offer you. Our expanded engineering department facilities are available now to aid you in your planning. Write us.

The Cushman Chuck Co.,
Hartford 1, Conn.



CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION





**Give WINGS
TO PRODUCTION!**

(Continued from page 138)
in Canada".

In introducing the three speakers, R. Eric Crawford, ASTE Toronto Chapter Vice-Chairman, said, "The sum total of Canada's war achievement is affected in no small degree by its American associations, because almost one-fourth of the manufacturing is done by American-controlled companies."

Speaking on the "Production Phase", W. A. Dawson, Chief Inspector, Otis-Fenson Elevator Company, Ordnance Division, Hamilton, Ontario, said that because of the peculiar machine tool problems facing Canadian industry the approach to a war production or even peacetime production job in Canada is much different than it is in the United States.

UNIVERSAL MACHINES FAVORED

"For example," he said, "an irregular shaped lever on an anti-aircraft gun was produced at an American plant by means of a special form cutter. This method of machining the part proved most economical, because the company had a surplus of idle Fellows Gear generators at their disposal."

"But the Canadian branch plant had no surplus machine tools of this type and analysis proved that their volume production did not warrant duplicate tooling. Hence, the operation was performed satisfactorily on a Morey vertical profiler which was available," he explained.

"In choosing machine tools, management should favor the selection of the universal or semi-universal machine, since volume production in Canada does not justify an investment in mass production machinery except in cases such as automobile manufacture," he continued.

"Generally speaking, volume production is comparatively small at the branch plants and production policies may require that several operations be performed on one machine. A long term view should be made of the stability of the product, otherwise if single purpose machine tools are procured, a change in product design might render them scrap long before they were worn or had paid for themselves in labor saved, in contrast to the labor saved had a standard machine tool been used."

U. S. MACHINES PREDOMINATE

Dawson said that during the 18 years prior to this war, British machine tools represented 10 per cent of those purchased in Canada. Canada produced 15 to 20 per cent of its own machines, while 60 to 70 per cent were imported from the United States. The importations from Britain and the Continent were general purpose types such as radial drills, horizontal boring mills, turret lathes, and a few types of milling machines and grinders, he said.

Between 1929 and 1939, Dawson continued, Canada imported \$55,000,000 worth of machine tools. During the last four war years, the Dominion has imported \$140,000,000 worth of machines. The production man estimated that the total number of single purpose machines that may be scrapped in Canada after the war "would probably amount to less than 20 to 25 per cent of the total purchases."

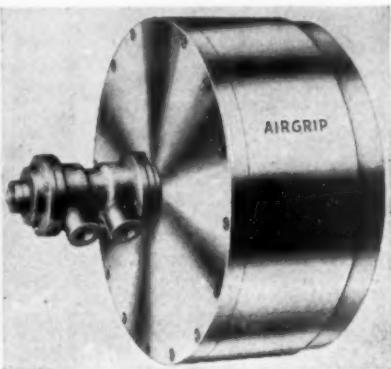
The "Personnel Phase" of Canadian
(Concluded on page 142)

THE TOOL ENGINEER

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"AIRGRIP" Revolving Air Cylinders, on double ball bearings permit speeds formerly impossible. Minimum maintenance. Today's top speed and peak efficiency requirements in air chucks demand superior air cylinder performance and service. Under average conditions, the cylinder will run for years without attention. No manual adjustment of packings. Wear automatically taken up by air pressure within the cylinder.



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3000 lb.-Pressure Self-contained Power Unit, driven by a 1/2 h. p. motor! Double-Pressure Production; consists of a low-pressure section which supercharges a high-pressure section. Builds up pressure fast, with minimum pulsation.

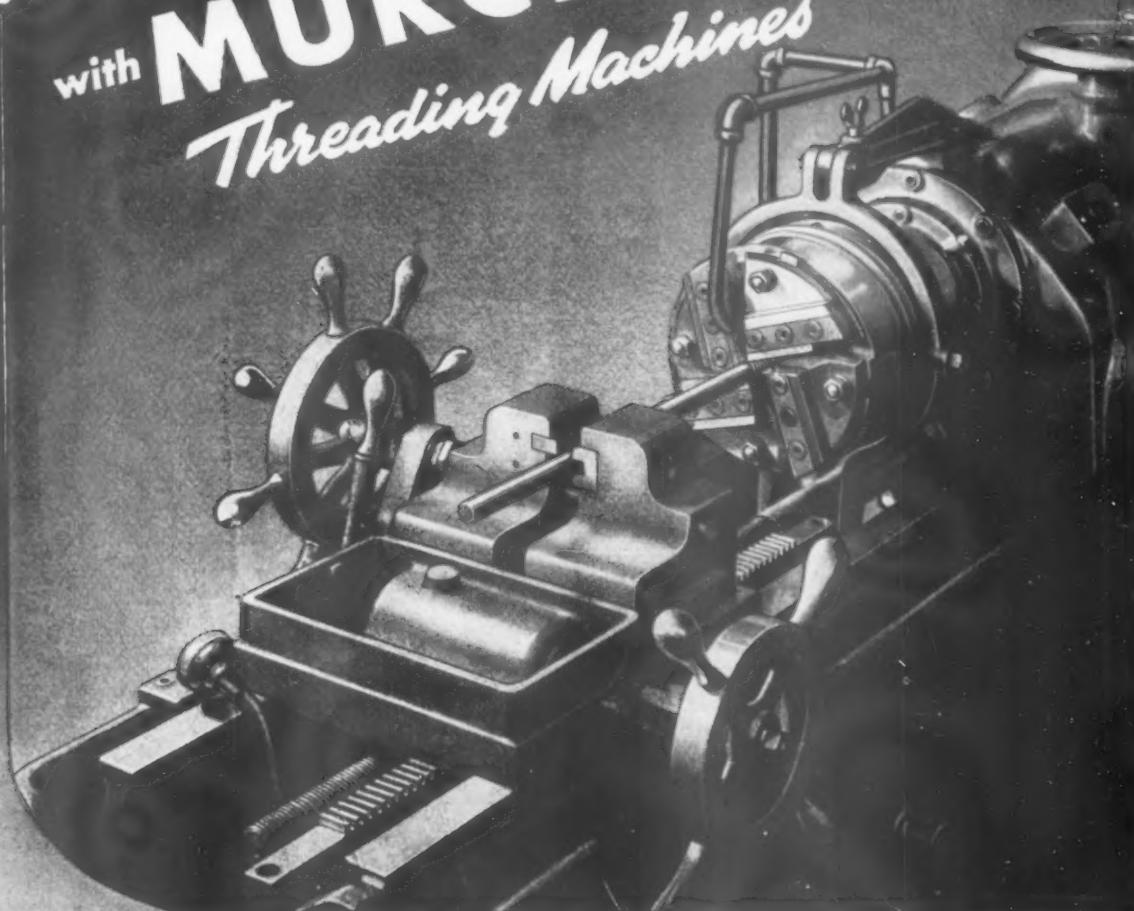
Write us for Bulletin, and consult Anker-Holth Engineers on pneumatic or hydraulic applications.

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Better →
Faster Threading →
with MURCHEY
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No. 11 and No. 22 MURCHEY THREADING MACHINES
are both available in SINGLE or DOUBLE spindles and
in either BOLT or PIPE machines

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Write for catalogue on both
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Machines to Dept. T.

MURCHEY

(Concluded from page 140)
production was covered by E. N. Wearn, Superintendent, Canadian Acme Screw and Gear Company, Toronto. In comparing U. S. and Canadian labor relations, he cited the work of the Canadian National War Labor Board in keeping inflationary movements under control. For example, the wartime average weekly wage in Ontario is approximately \$35. For Canada as a whole, he said, it is approximately \$32.

Before the war a 40 to 50 hour work week was common in Canada's larger industries, he said. Recent social legislation passed in Ontario, he continued, will limit the work week to 48 hours and assure every worker a vacation with pay.

U. S. BRANCHES IN CANADA

Edward Kennard, Vice-President and General Manager, St. Catherines Steel Products, Ltd., spoke on the "Management Phase" in the Canadian symposium. Pointing out that about two-thirds of American branch plants in Canada are located in Ontario, he said two reasons exist for locating a manufacturing plant across the border. "One is to reach the Canadian market with a 'Made in Canada' mark on your product. The other is to reach the British Empire market with benefit of the British Empire tariff preference," according to Kennard.

After becoming well established, the Canadian branch plant generally is between one-fifth and one-tenth the size of its U. S. parent, he added.

"The tendency is to do at least 85 per cent of the manufacturing involved in Canadian production at the Canadian plant," Kennard said.

As at recent national ASTE meetings, one session was devoted to the tooling and production of a complete war product. Subject of this session at Syracuse was "Tooling Instrument Work for Factory Production."

Four speakers represented Eastman Kodak Company, contractors for the Panoramic Sight. Its "Construction and use in the Field" was described by Francis M. Shull, Optical Engineer. Tools used in its manufacture were described by William R. Gordon, Chief Tool Engineer, while the training of unskilled workers for this highly intricate job were discussed by Howard C. Wellman, Training Supervisor.

TOOL EDUCATION TRAINING

The Society conducted its first national symposium on Tool Engineering Education, under the Chairmanship of Otto W. Winter, head of the ASTE Education and Training Committee. The outlook of colleges on the functional training methods adopted by the Armed Forces, and the problems faced by these schools in incorporating func-

tional training in their curricula were discussed by Dr. Mark Ellingson, President, Rochester Institute of Technology.

Wm. F. Patterson, Director, Apprentice-Training Service, War Manpower Commission, spoke on the necessity of a national apprenticeship system, affording opportunities for returning veterans and preparing workers for skilled jobs in postwar manufacture.

SUGGESTS APPRENTICE BRANCH

L. J. Fletcher, Director of Training, Caterpillar Tractor Company, in the concluding talk on the program made a plea for "Training Tomorrow's Tool Engineer."

Fletcher said, "The members of the American Society of Tool Engineers must be concerned with those younger members of their profession or, even more important, those younger men who are now laying the foundation on which to build their careers as tool engineers."

Outlining a plan for training the nation's mechanically minded young people, Fletcher called for an apprentice branch of the Society.

"The branch would operate under a constitution and set of by-laws supplied principally by the parent Society with certain leeway afforded each local branch," Fletcher explained.

THE END

METAL SHOW BIGGEST IN HISTORY

CLEVELAND, OHIO

Men, materials and machines crowded Cleveland's huge public Auditorium the week of October 16 to make the National Metal Congress and War Conference Display the biggest in history. There were more than 400 exhibitors, as compared to 250 at the biggest previous show, two years earlier. But more significant than displays or lectures were the thousands of visitors who jammed the exhibition floor and lecture halls asking "What's new?"

Production engineers, chief engineers, and other men of influence passed through the front doors of the huge auditorium at the rate of 10,000 a day, looking for a better way to do a job. For the large percentage who have not been able to stir from wartime jobs in three or four years, there was much that was new.

Both buyers and sellers talked some about what they thought they would supply, what they thought they would need. But right now, parties to almost any deal are involved in war production, and there is reason to believe that the meeting made its prime contribution to getting it over faster. The affair had the aspect of being a preliminary to the big event, reconversion.

Machines, processes and products covered the field of metal-making, fabrication and treatment. Tools of all types were on exhibit, including hack saws, electric drills, diamond tools, milling cutters, abrasive cutting machines, and wheels.

Technical societies associated in the exhibit and sessions were the American Society for Metals, the American

Welding Society, the Iron and Steel and the Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial Radium and X-Ray Society, and the Society for Experimental Stress Analysis.

Nearly 200 research developments were discussed in morning, afternoon and evening sessions by the five societies. Attendance for single meetings ran as high as 700 and 800.

At the main meeting of the last day's sessions, the national picture with regard to availability of materials and machines was consolidated by Lieutenant Colonel William Walter Phelps, Area Representative of the Cleveland Office of the Central Procurement District of the Air Technical Service Command.

STATUS OF METAL SUPPLY

According to Colonel Phelps, metals are now fairly free. Exceptions are fabricated forms such as steel tubing, carbon steel sheet, aluminum die and mold castings, insulated copper wire, cadmium, nickel, tin, monel and inconel. The most critical shortages, however, have been caused by late ordering, caused by design changes or fear of cutbacks. The bottlenecks on forging hammers has been gradually widening. But labor is still a critical factor in steel and aluminum foundry work.

No one can accurately predict the full effect of Germany's fall in releasing metals for consumer use. Because there may be shortages of some types of metals, manufacturers of refrigerators,

tors, for example, may be frustrated by lack of a single item such as copper tubing. The whole situation naturally hinges upon military strategy. Though a sudden drop in production is not expected in that many terminations calculated for victory over Germany have already taken place, the cut in top war production is guessed at from 20 to 40 per cent.

Colonel Phelps believes that the greatest lessons which industry has learned from its war production job is in the manufacture of precision products on an economical basis. Tenthousandths of an inch and micro-finish have become fairly general specifications. Improvements in die casting and precision casting are outstanding.

Advances in tooling have to a large extent been the result of the fresh outlook of newcomers to a job. Where the aircraft industry hesitated to develop first class tooling for parts required in great quantities, the automotive industry was able to show value in its methods. On the other hand, where relatively few parts were needed, such as for fabrication of fuselage parts, typical aircraft methods with their flexibility held sway.

Metallurgists were credited for the investment molding method which proved successful in manufacturing turbo-supercharger buckets, for casting and plating silver bearings, and for the development of National Emergency Steels. In view of modern techniques of inspection—X-Ray, magnetic inspection, and accelerated fatigue tests, their achievements have been made in spite of more critical requirements. THE END

THE TOOL ENGINEER

Multi-ribbed wheel thread grinding

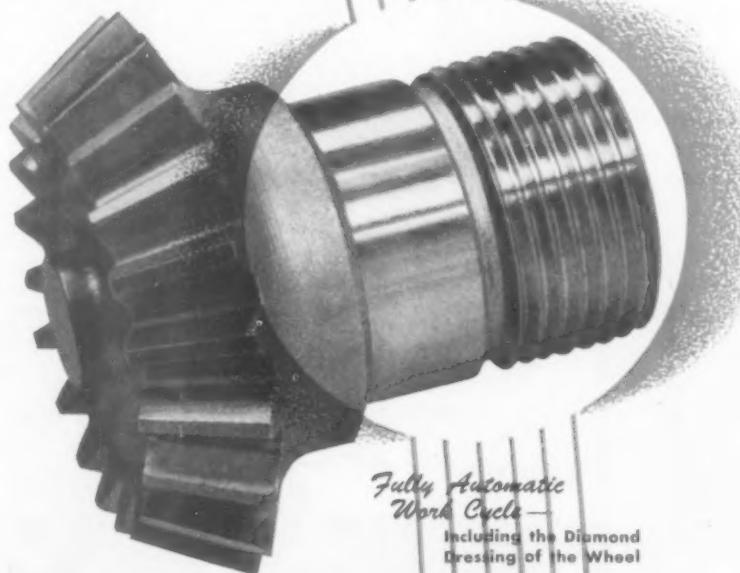
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The grinding wheel is diamond dressed by an Automatic Multi-form Trueing Device; consequently an accurate, free cutting wheel is obtained, and either resinoid or vitrified wheels can be used. With this same Trueing Device, the **20-INCH DIAMETER WHEEL** can be dressed for three different methods of multi-ribbed wheel thread grinding, as well as for many varieties of plunge-cut form grinding.

The fully automatic work cycle of Jones & Lamson Thread Grinders means greater production and greater profits. Consult us for recommendations and more detailed information. Your inquiries will receive our prompt attention.



THREAD SPECIFICATION

1-3/16" — 12 N.S. — Class 3

MATERIAL

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MACHINE CYCLE

20 seconds per piece — 20 pieces between wheel dressings.

WHEEL DRESSING CYCLE

35 seconds. Controlled by electric counter, thus maintaining fully automatic work cycle.



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Just a pitch diameter measurement is not enough. Lead, thread angle, and pitch diameter must be checked to prove they are within their tolerances. Only then is a gage accurate.

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The finish must be smooth, whether on a thread or plain plug. Unlapped surfaces wear off rapidly, making the gage undersize in a short time.

• Check the Steel

Only the finest tool steels are used by Republic Gage on all gages. Reports from customers have shown greater wear life from Republic gages.

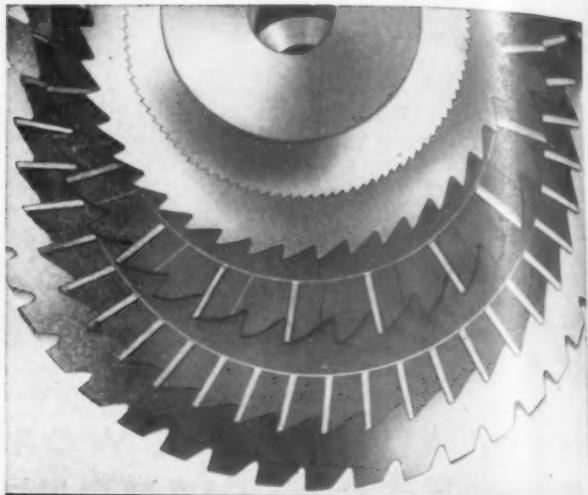
• Check Source of Supply

Republic Gage's policy of making only highest quality gages, and industry's acceptance of that fact means you can rely on Republic Gage Company as your first source.

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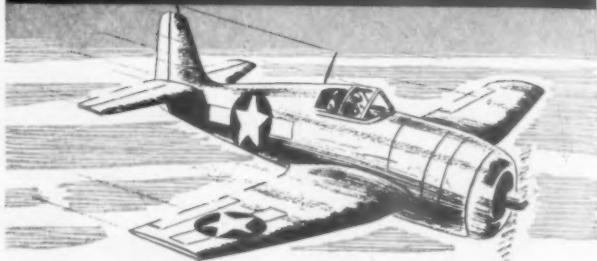
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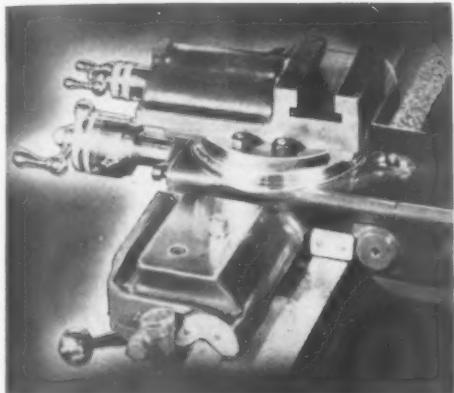
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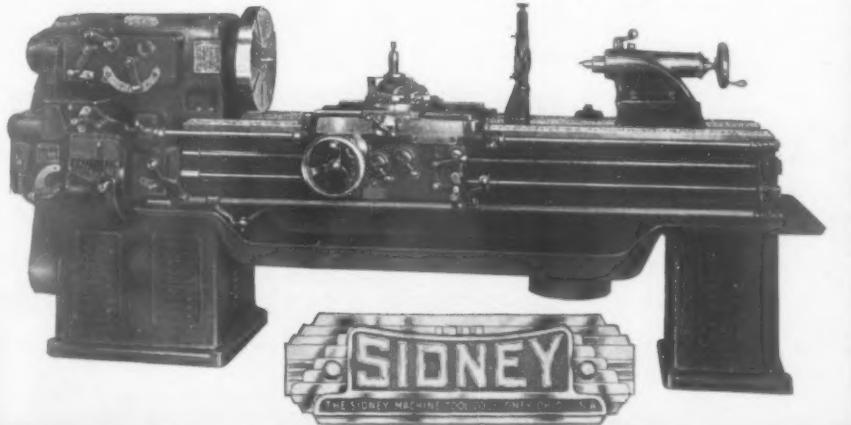
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. . . A micrometer stop on the cross feed provides an adjustable depth stop for turning or threading—and for internal and external thread chasing . . . The swivel of the compound rest is graduated 90° each way from center and is securely held in place by four bolts . . . Note center gib provided in addition to front and rear gibs under V ways . . . Bulletins on each model available.



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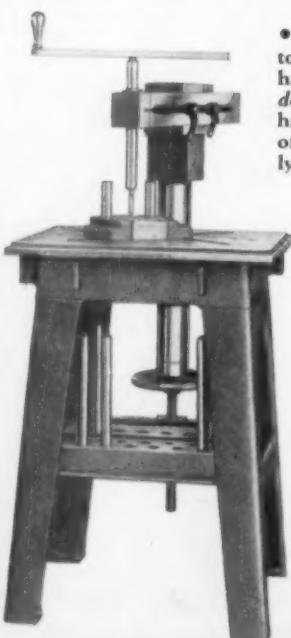


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• Among the important improvements is the sliding arm with vertical, horizontal, and lateral adjustment — to position taps in any place on the table. Taps in sizes from No. 5 to 1" diameter are readily handled.

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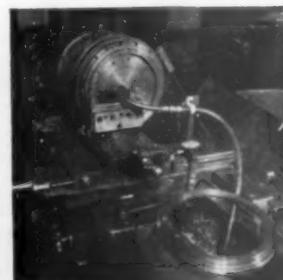
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"We are pleased to say
this has meant a 300% in-
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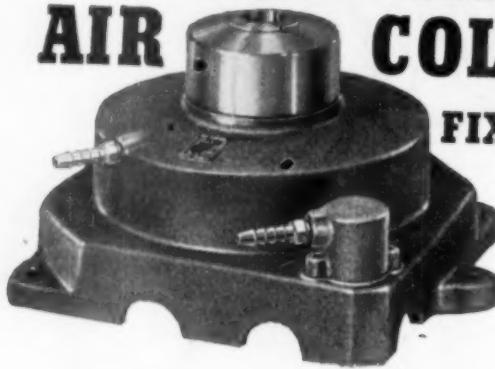
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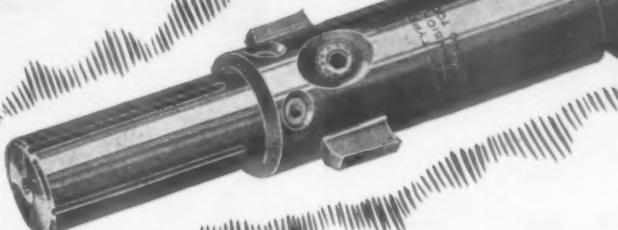
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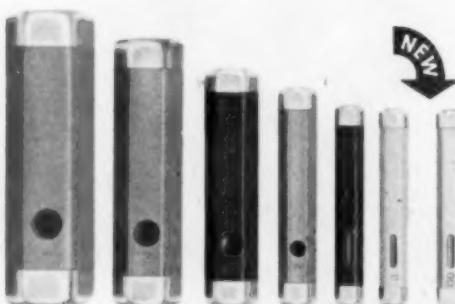
MADE of light weight plastic material, Federal Gage Handles are lighter than any metal used, even one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue in long continued use; an advantage appreciated by women inspectors.

They are highly satisfactory with glass gages being so much lighter than metal handles, they reduce the danger of chipping and breakage.

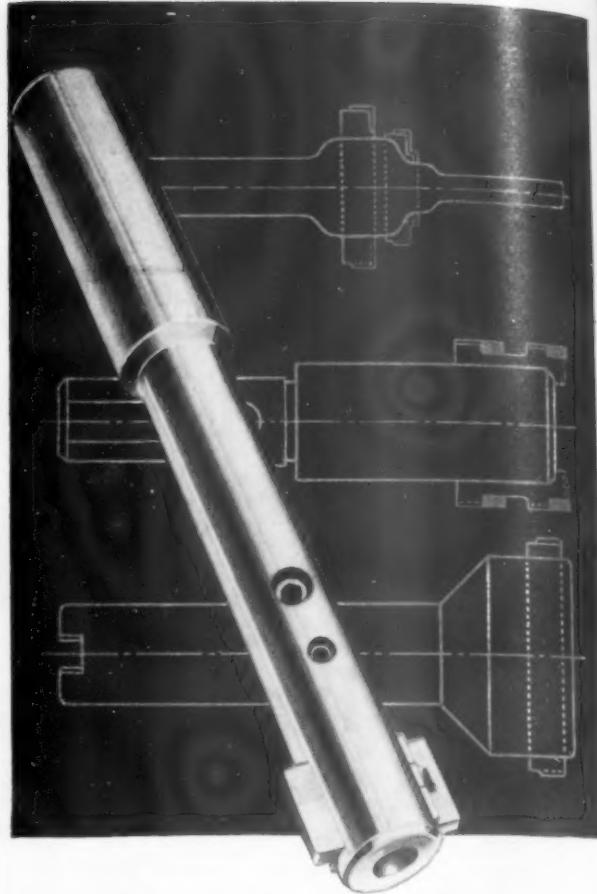
Insulating properties help prevent transmission of bodily heat to gages which may affect accuracy.

Marking for identification is accomplished with the same marking tools used for metal gages. Available in 7 Sizes—00 for Small Gages, 0, 1, 2, 3, 4, and 5. In 4 Colors—Red, Yellow, Green and Black.

IMMEDIATE SHIPMENTS
ON RATED ORDERS



FEDERAL TOOL
CORPORATION
408 NORTH LEAVITT ST., CHICAGO 12, ILL.



finish reaming ... IN ONE OPERATION

Close tolerances as low as .0002 of an inch can be held with Madison reaming tools. Madison tools at the same time produce a mirror-like finish that in most cases eliminates additional finishing operations. They answer modern industries' demand for faster, better techniques for all reaming operations. Time saved with Madison's allows a lower estimate on present and post-war contracts.

Madison tools are simpler and easier to adjust, thereby saving vital minutes in set-up time. With Madison's, distortion, flute load and overheating are avoided. This eliminates shrinking or tapering of the finished hole and cuts costly rejects and scrap.

Madison's are used for rigid or floating reaming on engine and turret lathes, automatics, radial and standard drills, boring mills, millers and machines for special operations. Manufactured in standard and special sizes for use on hard metals, soft metals and plastics.

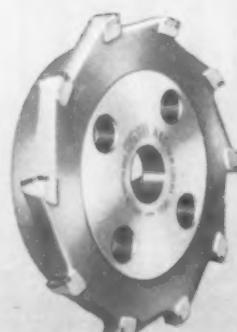
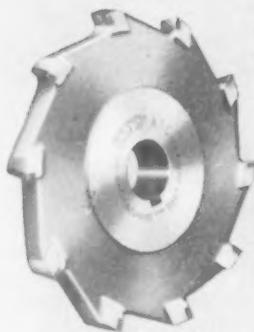
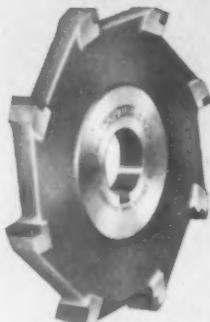
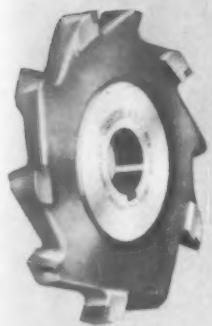


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MADISON
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THE TOOL ENGINEER



TungTip

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LUMINUM — MILLED AT HIGHEST FEED
WITH 1000% MORE PARTS PER GRIND

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CAST IRON — MILLED AT CAPACITY OF
MACHINE WITH GRINDER-LIKE FINISH

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THE FIRST OF
A SERIES OF
ENGINEERING
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TOOLS

P. O. BOX 88

DIVISION OF
LOWELL AND GRAYSON

MONROVIA, CALIF.

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CAN BE
DEPENDED UPON
with improved
MILFORD
PROFILE
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Thanks to MILFORD metallurgic and manufacturing improvements . . . back and side wear is counteracted . . . bowing and stretching eliminated. The saw is stiffer and cuts true to the line.

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THE HENRY G. THOMPSON & SON CO.

Saw Specialists Exclusively for Over 65 Years
NEW HAVEN 5, CONN., U. S. A.



"OH-38"

WILL HELP YOU DO IT IN 1945

Sustained post-war employment means large volume production of better products at reasonable prices . . . that's the story.

- Many component parts of your post-war products can be made better, faster, cheaper—with OH-38.

OH-38 Aluminum Alloy—Non-Heat Treated—an exclusive product of Hedstrom—is a perfected metal with proven superiority in a wide range of machining operations.

Easily machinable—easy on tools—increases tooling accuracy—holds threads without stripping. Non-corrosive—non-oxidizing—non-magnetic—spark-proof—does not require heat treatment—will not expand or contract. Tensile strength: 35,000 to 40,000 lbs. per square inch. Polishes to silver mirror brilliancy—takes chrome, nickel, or tin plating—may be anodized. Has many other manufacturing advantages.

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*Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings.
Pattern Makers. Complete Mechanical Assemblies and Models to Specifications.*

THE TOOL ENGINEER



Hats off to Ordnance!

Tom Adams



MANY years before the first bomb fell on Pearl Harbor, Ordnance officers had worked out a brilliant and detailed plan for the defeat of our enemies.

With vast technical knowledge and skill, these men of vision labored long and hard to make sure America would be able to

rise to any military emergency.

The miraculous swiftness with which American plants shifted from peace-work to War Work was largely due to these officers who charted every step, blueprinted every item . . . anticipated difficulties and solved problems in advance.

In our opinion, this will be recorded as the greatest engineering job of all time. For this and other outstanding service to their Country, we say: "Hats Off to Ordnance."

Keep on Buying War Bonds

QUALITY TOOL & DIE CO.

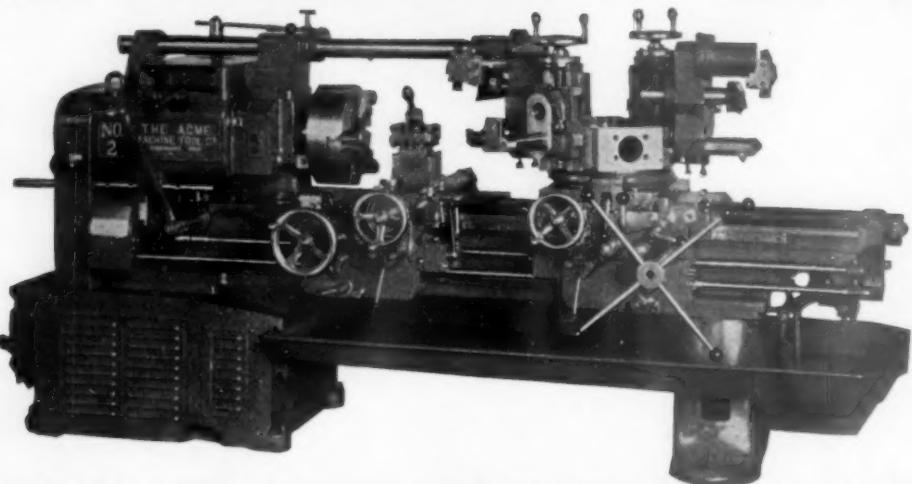
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CINCINNATI
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TURRET LATHES

SPEED PRODUCTION--SAVE TIME

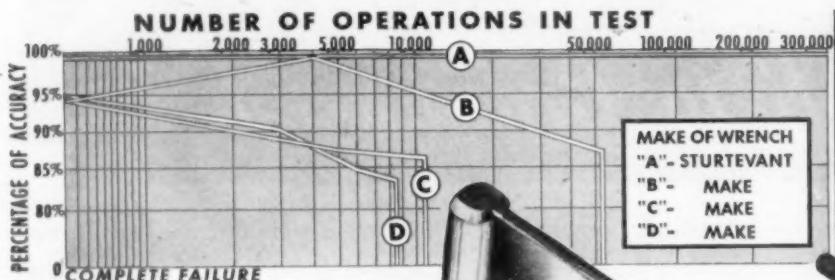


GREATER RIGIDITY AND ACCURACY UNDER HEAVIER CUTS AT FASTER SPEEDS!

The above illustrated No. 2 ACME Universal Turret Lathe with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. These features assure accuracy while faster speeds are possible through the use of cemented carbide cutting tools. This machine features heavy duty multiple turning heads and vertical side tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages.

• WRITE FOR COMPLETE DETAILS.

THE ACME MACHINE TOOL CO. 4955 SPRING GROVE AVE., CINCINNATI 32, OHIO



300,000 DEFLECTIONS and still Accurate

Over 100 models and types with capacities from 0-40 inch ounces to 7200 inch pounds.

Sturtevant
QUALITY
Permanently Accurate
TORQUE WRENCHES

As in any other measuring, limiting and inspecting tools, the first requisite of a torque wrench is accuracy. This accuracy should be permanent for few indeed are the users who have means of periodically checking the accuracy of a torque wrench.

STURTEVANT TORQUE WRENCHES are *inherently accurate* because they use the entire beam of the wrench as the measuring element and readings are direct—not through gears, levers or other error-compounding mechanisms. They will give you years of service because the beam is ground to uniformly spread operating stress along its entire length, and all deflection is well within its elastic limits. They are practically *indestructible*, and can be handled like any other tool, on the bench, in the tool box, etc.—have no fragile dials, delicate springs or parts. That is why the majority of Torque Wrenches in use today are STURTEVANT TORQUE WRENCHES.

Write for Bulletin TW-28



P.A. Sturtevant Co.
ADDISON **QUALITY** ILLINOIS

Designed and Engineered for
Rapid, Positive Clamping, Maximum Open Clearance

DANLY Kwik-Klamp TOGGLE CLAMPS

To Speed Assembly, Machining Operations, Metal and Plastic Stamping.

For complete data, including tested pressure figures, send for the new Kwik Klamp Catalog.

DANLY MACHINE SPECIALTIES, INC.

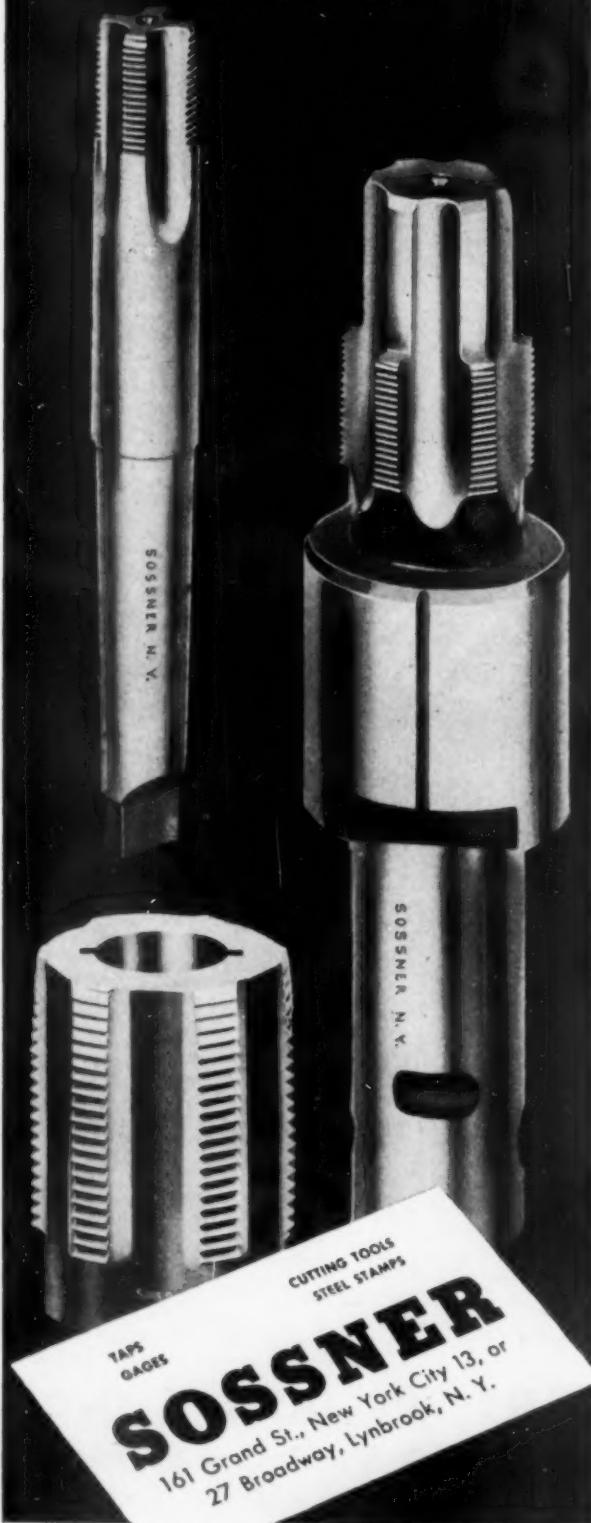
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Chicago 50, Illinois

**33 YEARS OF PRECISION WORKMANSHIP,
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TAPS AND GAGES IN AMERICAN NATIONAL,
BRITISH AND SPECIAL THREAD FORMS.



156

**For Gang-Milling Jobs
up to
150 Saws per Set-up**



**... Use
SIMONDS
Metal-Slitting
SAWS**

On jobs like this—slitting high-carbon steel sheets from $\frac{1}{16}$ " to $\frac{1}{4}$ " thick—Simonds Metal-Slitting Saws cut with smoothness and accuracy that eliminate extra operations often needed. And in addition to metal-slitting, the high-speed steel saws are used in many other applications using up to 150 saws in the set-up.

Simonds Carbon and High-Speed Metal-Slitting Saws are made from Simonds steel of uniform grain size and structure for longest cutting life. Tolerances are rigidly held, to assure correct slot-widths and spacings. And each saw is radially ground for lump-free clearance in operation. Order from your dealer or from the nearest Simonds office . . .

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SIMONDS
SAW AND STEEL COMPANY
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PRODUCTION TOOLS FOR CUTTING METAL,
WOOD, PAPER, PLASTICS

THE TOOL ENGINEER

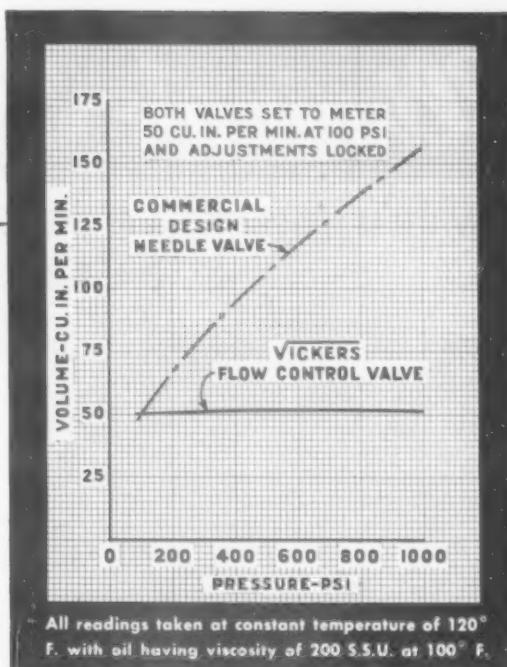
CONSTANT FLOW RATE

REGARDLESS OF VARIATIONS

IN FLUID PRESSURE

Automatic Pressure Compensation

Adjustable Overload Pressure Protection



VICKERS

FLOW CONTROL AND OVERLOAD RELIEF VALVES

In hydraulic control systems, this valve combines the functions of a flow control valve with an automatic relief valve to save space and simplify installation. It maintains a constant "metering-in" flow rate (for a given setting of the control adjustment) regardless of any variation in imposed fluid pressure resulting from changes in work resistance. Pump operates only at pressure required to do the work at hand; relief valve is independently adjustable and limits the maximum system pressure to any desired value.

This valve combines in one unit the means for accomplishing three independent functions: (1) adjustable control of flow rate in the hydraulic circuit, (2) adjustable overload pressure protection in the hydraulic system, and (3) remote "Start and Stop" control when used with suitable pilot valve. See Bulletin 40-22 for complete information. Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

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MOTORS



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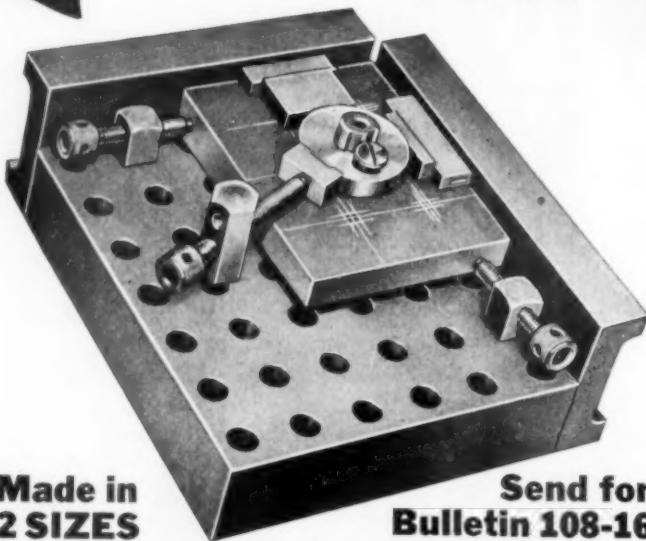


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BLINDS

Eliminate COSTLY MACHINE TOOL *Equipment*

WITH THIS ANGLE PLATE

"HOLOCATOR"



Made in
2 SIZES

Send for
Bulletin 108-16

For accurate locating of all drilled and reamed holes and the laying out of dies and drill jigs, you can perform this task on any drill press very quickly with this tool-makers' device.

This precision device will take care of about 75% of the work that has to be performed on the average Jig Boring Machine.

This "Holocator" can also be used to advantage as a universal precision drilling and reaming jig, where accurate duplicated parts are required in small lots and where ordinarily a special jig would be required.

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DAYTON ROGERS MFG. CO.

1913 FOR THIRTY-ONE YEARS 1944

MANUFACTURERS OF PRECISION CUTTING TOOLS



- TODAY: Our entire output is being supplied to manufacturers making war materials.
- TOMORROW: We look forward anxiously to the post-war period when again we can supply industry with "Tools of Distinction."

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TWIST DRILLS,
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AEROMATIC DRIVES, PILOTS,
AND COUNTERSINKS

**COGSDILL
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★
LET US ENGINEER
YOUR
DRILL AND REAMER
PROBLEMS

Since this die has been made
of GRAPH-MO STEEL
press room troubles have stopped



This die is used to blank and form cages for Timken Roller Bearings. It's a fussy job. The cage blanks must be accurate and scratch-free to meet the rigid standards demanded for Timken Bearings.

Many tool steels were tried for this die. The best life provided by any of them was 1,000,000 pieces, and it was necessary to regrind the dies after 50,000 pieces were run. Pick-up, galling, scoring and pitting were also problems when those steels were used.

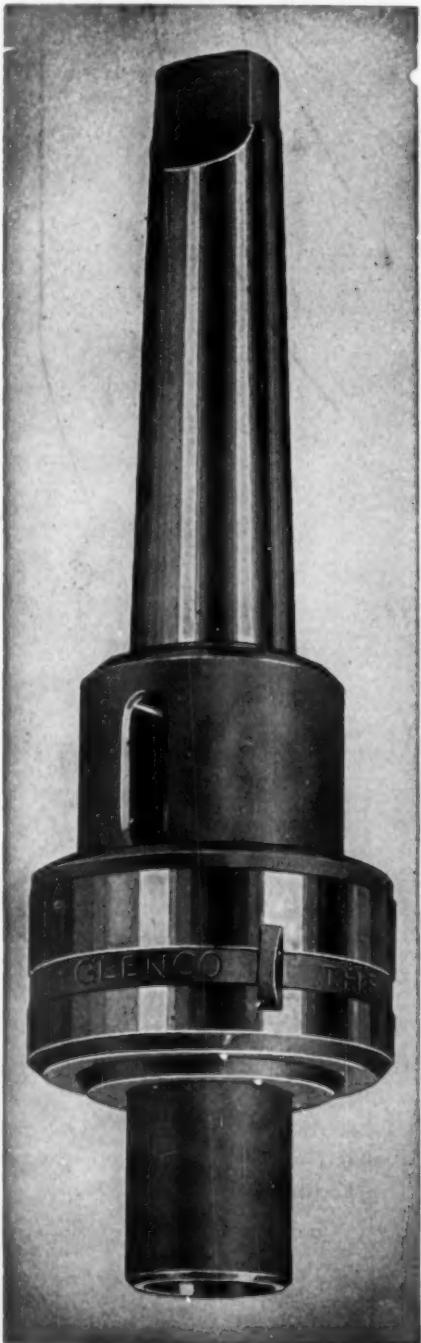
Since the dies have been made of Graph-Mo Steel, they blank and form 300,000 perfect, scratch-free pieces before they have to be reground, saving six to seven hours per run by eliminating non-productive time required formerly to make frequent die assembly installations. Because 80 cages are blanked and formed every minute, the time saved made production figures soar. In addition dies made of Graph-Mo Steel produce 3,000,000 pieces - - - three times the life offered by ordinary tool steels.

To increase production of your products and to secure longer tool or die life, use Graph-Mo or one of the other Graphitic Steels, Graph-Sil, Graph-Tung, Graph-Al or Graph-M.N.S. They machine at least 25% faster than competing steels, they provide stubborn resistance to wear and offer excellent response to heat treatment. These steels are readily available from the stocks of your nearest distributor or direct from the Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

GLENCO FLOATING TOOLHOLDER

*Corrects Machine Tool Misalignment By
Producing TRUE and ACCURATE Holes*



Also Manufacturers of

Utility Tools

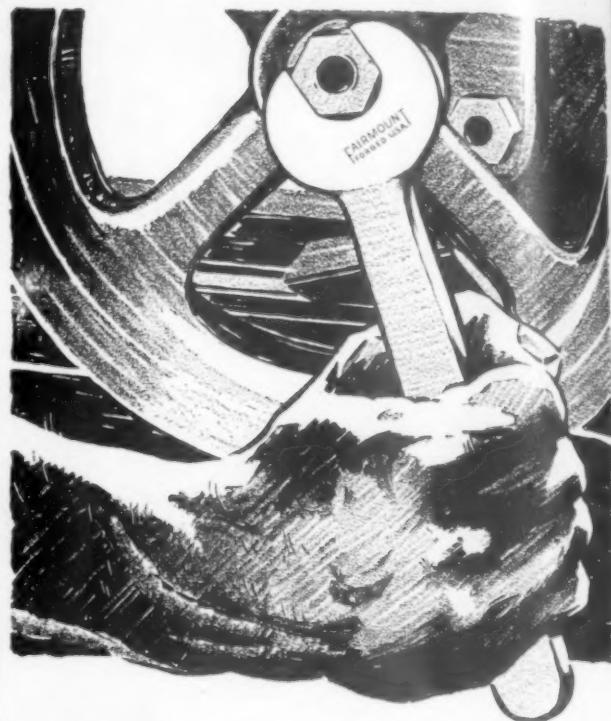
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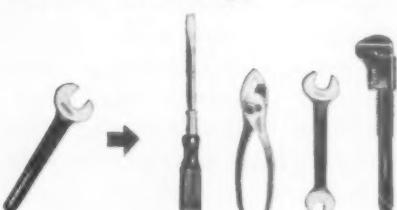
THE J. C. GLENZER CO.
DETROIT MICHIGAN

FOR PERFORMANCE



AND LONGER LIFE Give Them FAIRMOUNT SERVICE TOOLS

→ YOUR PRODUCT will give better service when equipped with correctly designed FAIRMOUNT drop forged hand tools.

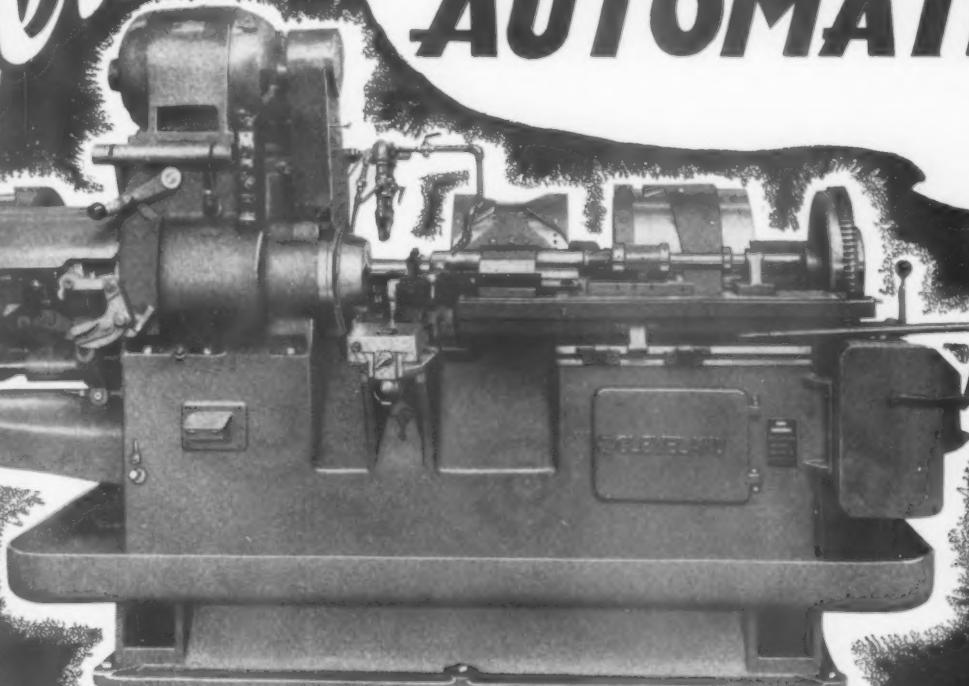


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The FAIRMOUNT
TOOL & FORGING COMPANY
Hand Tools • Special Tools • Forgings
10611 QUINCY AVENUE • CLEVELAND, OHIO

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new*

CLEVELAND AUTOMATIC



MODEL B
 $3\frac{3}{4}$ " and $5\frac{3}{4}$ "

FOR THAT TOUGH JOB of making high basic costs, plus high production quantities, plus high structural quality fit increasingly competitive prices. The new Cleveland applies greater efficiency in production (only solution to this problem) to processing a wide range of bar or tube stock into finished pieces up to $5\frac{3}{4}$ " diameter . . . Forming and turning multiple O.D. plus one end working position.

Also ideal for second operations, with "automatic loading" to speed output. Not a postwar dream, but an efficient and productive adaptation of work-tested features from the broad line of Cleveland Automatics with capacities from $\frac{9}{16}$ " to 10". Write for our descriptive Bulletin.

Remember... Clevelands Cut Costs

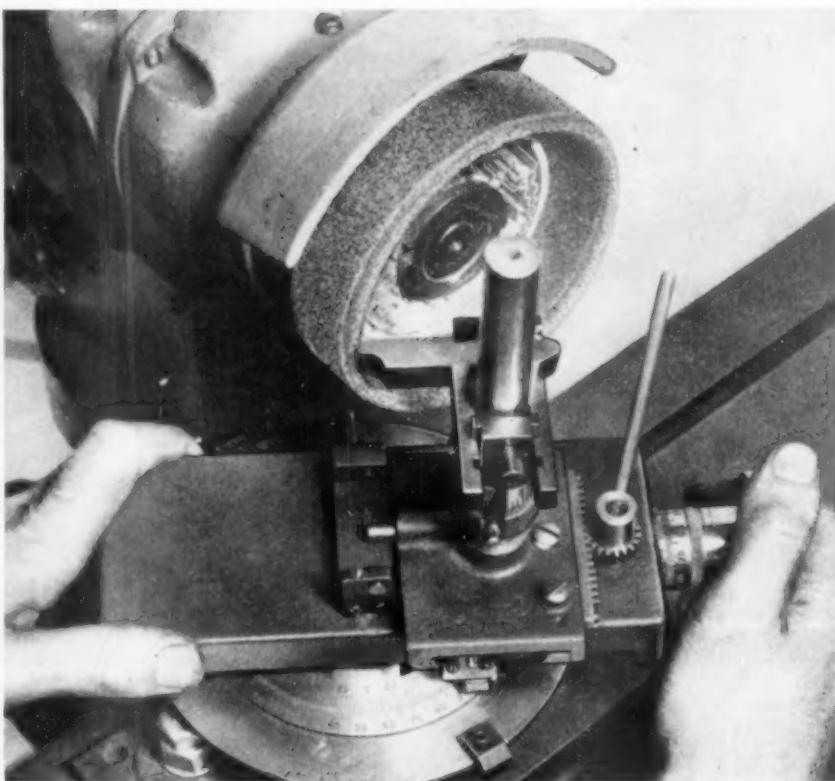
THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND 3, OHIO



NEW EQUIPMENT

• Materials + Processing •

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY



Instrument forms radii and angles conveniently

COMPANY NOW OFFERS (Q28) NEW TOOL ROOM ACCESSORY

Development of a radius and angle forming instrument is announced by W. F. Meyers Company, Inc. The device is called Radiform and is capable of forming angles and radii without preforming the wheel. The instrument can be mounted on different types of grinder tables and can be operated by unskilled operators.

The collet holder is connected to an arm, actuated by an adjustable cam, so that radii and angles are generated to follow exactly any helix angled flute. Clearance angles are pre-determined as are the radii and angles to be formed. Extreme accuracy is assured by micrometric adjustment before forming.

TOOL FIRM BUILDS LINE (Q29) OF PRECISION MICROMETERS

Central Tool Company has completed and is offering a new line of Central Certified Accuracy Micrometers. A black enamel finish has been developed to replace the polished steel frame. This permits lower prices without impairing accuracy of the micrometers. Available in sizes from one to six inches with ratchet stop, lock nut and .0001" graduations. There is also a full range of metric "mikes".

ENGINEERING COMPANY (Q30) DEVELOPS TWO DIE CASTERS

Die casting machines, one for zinc, tin and lead alloys and one for aluminum, brass and magnesium alloys, have been developed by Lester Engineer-

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

ing Company for Lester-Phoenix, Inc. Both machines are readily convertible from zinc operation to aluminum and from aluminum to zinc. Each is high-speed, high-pressure operating. They are smaller and lighter in weight than the regular Lester-Phoenix line, but have similar features, and are designed specifically for high production of smaller castings.

The zinc machine is billed as the fastest cycling commercial die casting machine ever built. Manufacturer reports 750 cycles per hour without load and 400 to 500 shots per hour, depending on size of casting and chilling rate. Injection pressures range from 2200 psi for a four pound casting to 1400 psi for a six.

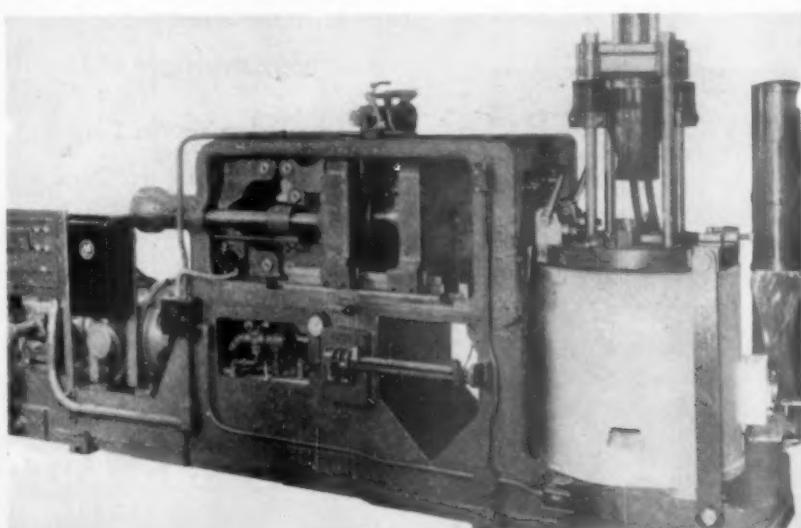
The aluminum machine differs in that it has a cold chamber injection system instead of a submerged plunger. Injection pressures up to 20,000 psi are available. It is said to produce strong, dense castings capable of passing the most severe inspection, including 100% X-ray.

Rugged construction should reduce maintenance costs.

SHEFFIELD ANNOUNCES (Q31) THREE NEW GAGE ADVANCES

The Sheffield Corporation reports three advances of interest to precision gaging. The first of these is a standard ball point accessory for Sheffield

(Continued on page 166)



Die casting machine for zinc, tin and lead alloys

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When answering advertisements, specific information on problems or company representative's call.

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for requesting additional information or bulletins about new equipment, materials, processes, etc.



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when answering advertisements, to obtain specific information on problems, or when you desire a company representative to call.

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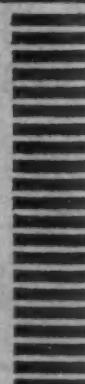
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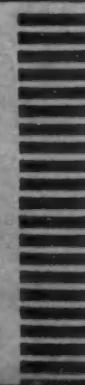
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Here's Help

FOR YOUR TOOL ROOM



The New **COVEL** CUTTER & TOOL GRINDING MANUAL

A time-and-money saving factual aid for new hands in the toolroom—and for seasoned veterans, too! A 128-page book that takes you through every step in setting up all types of milling cutters for grinding; that explains in graphic detail the use of various accessories on cutter and tool grinders;—covers thoroughly the operation and use of a cutter and tool grinder;—gives practical help in choosing the right grinding wheel for every job . . . Plus page after page of grinding tips and short cuts that will mean added savings in time and manpower for you. And there's a whole section of tables and charts, arranged for handy reference, to cut down pencil and guess work. Write your name and position on your company letterhead, and send it to us for a free copy of this new Covell Manual, "Universal Cutter and Tool Grinding"—A regular \$1.00 value—but it's free to you toolroom and production men. Write for "Handbook A22C" today! TE-114

This is just another example of Covell Service to industry. Since 1874, manufacturers have been bringing their grinding problems to Covell, with complete satisfaction. This company now offers a complete line of Cutter and Tool Grinders, Drill Grinders and small Surface Grinders. Let Covell experience show you what can be done to improve production and cut costs in your toolroom.



Covell No. 12 Cutter and Tool Grinder

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS
COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

NEW EQUIPMENT

visual gages for rapid and accurate checking of pitch diameter. Accuracy parallels that obtained by the three wire method. The advantage is in speedier checking.

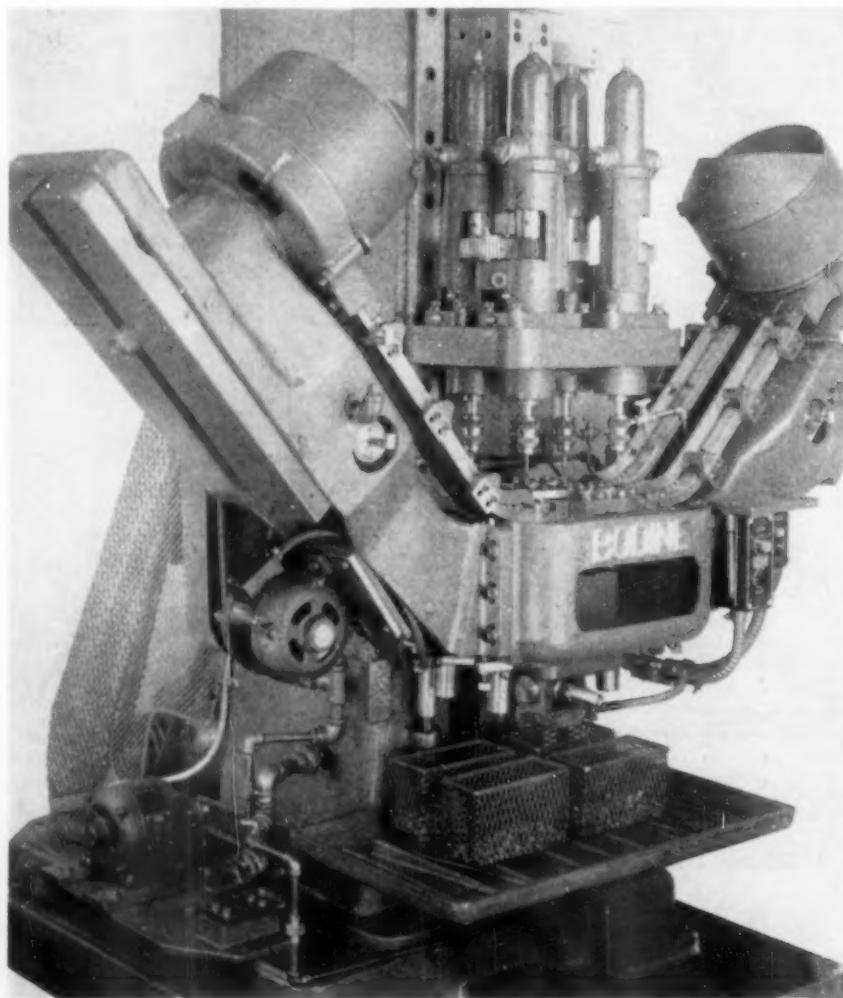
The accessory consists of a chromed bracket and adjustable backstop with a thread checking ball point of tungsten carbide mounted in the bracket. A second identical ball point is provided in the spindle. The accessory has a capacity of one inch maximum work diameter.

A second contribution to the gaging field is the new type precision height indicator with Electrigage to give positive, accurate readings. It is designed for use on a surface plate. The instrument includes a surface plate block, a 26" column with rack and a Sheffield Electrigage, 1000-1 amplification, smallest graduation .0001", with electric pickup head mounted on an adjustable extension arm.

Third of the improvements is introduction of a new type snap gage spindle for use with the Precisionaire instrument. The application combines features of snap and air-flow gages. Advantage of this kind of spindle is that it can be used on highly finished or soft plated parts without marring or scratching them. It can also be used on exceedingly thin walls.



Special machine designed to save complicated setups



Automatic feed nut tapping machine for aircraft nuts

COMBINATION MACHINE (Q32) DOES BORING AND MILLING

Special production jobs involving boring and turning and on which pads or slots had to be milled dictated the design of a combination boring and milling machine being produced by Cincinnati Planer Company. This machine saves complicated setups and time.

The bed is one piece, heavily ribbed. Transmission is fully anti-friction and all gears are hardened. Flat table tracks are bolted to the bed and the table is centralized and given radial support by a large anti-friction bearing mounted in the center of the table.

There are 16 speeds in geometric progression to the table ranging from one to 30 revolutions per minute. Through special design a low horsepower motor drives through a worm drive box providing milling feeds from 2" per minute to 80" per minute. The same transmission is utilized in both table drives.

BODINE PERFECTS NUT TAPPER WITH AUTO-FEED (Q33)

A fully automatic nut tapping machine, which delivers four nuts simultaneously, has been perfected by Bodine Corporation. Two hoppers feed nuts automatically to four stations where spindles are operated with controlled speed.

Taps start at slow speed and reverse at twice tapping speed. This produces

(Continued on page 168)

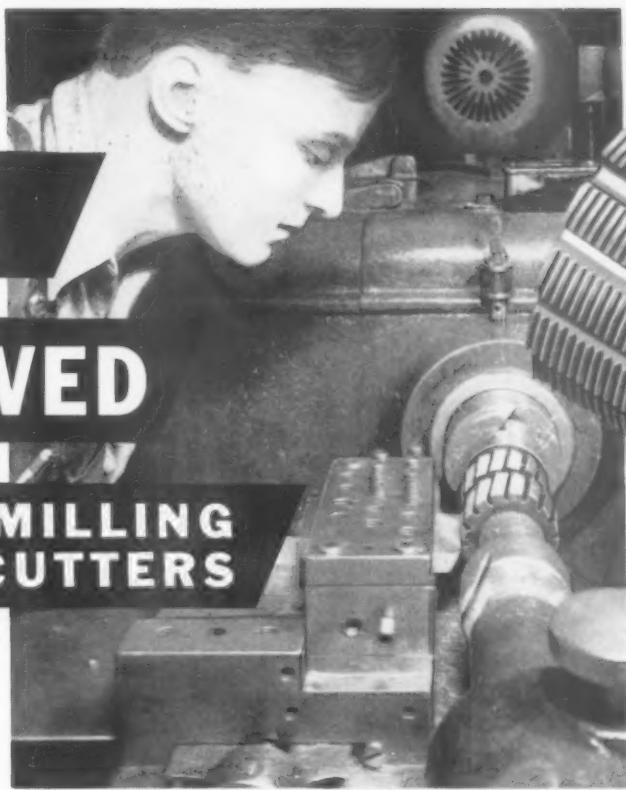
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FORM

RELIEVED

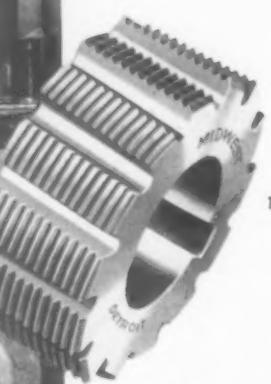
THREAD MILLING CUTTERS



Shell Type
Thread Milling
Cutter



MIDWEST
DETROIT



Shank Type
Thread Milling
Cutter

Putting Form Back-Off on
Shell Type Thread Milling
Cutter in Midwest Form-
Relieving Department

MIDWEST Multiple Thread Milling Cutters are a type of form relieved cutters designed and made to produce in large quantities, speedily and economically, parts requiring short outside or inside threads.

The rows of teeth on these multiple cutters run around the cutter in a true circular pattern. Unlike the teeth in a hob, the rows do not travel progressively, i.e., "in a lead". It is this feature that especially marks the difference between multiple thread milling cutters and hobs. Since multiple thread milling cutters are *not* made with a lead, they should not be designated "Thread Hobs".

Midwest Shell or Arbor Type Thread Mills are the type most widely used since they are used essentially for external work. However, in many cases when the diameter permits, they can be used for internal operations.

Midwest Shank Type Thread Mills are used essentially for internal work when the cutter cannot be carried by an arbor. In many cases, however, they can be

used on external work.

Spiral gashed cutters are recommended for most work. They produce a shearing action and continuous cutting from flute to flute. This tends to eliminate chatter, vibration, and provides smooth even surfaces and finish. When sharpening these cutters, correct spiral gash should be maintained or thread forms will distort. Free-hand sharpening should be avoided. Sharpening should be mechanically controlled to preserve original radial or rake teeth and spiral gashes.

Midwest has been designing and manufacturing all types of Precision Metal Cutting Tools for more than 33 years. This experience can help you hurdle production problems. Send us your inquiries; they will be carefully analyzed.

Do you have handy a copy of
Midwest's 200 page illustrated Cata-
log No. 17 of cutting tool data?
If not, ask for one on your company's
letterhead.

MIDWEST TOOL & MFG. CO.

MILLING CUTTERS • SLEEVES • COUNTERBORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

2352 WEST JEFFERSON AVENUE • DETROIT 16, MICHIGAN

NEW EQUIPMENT

four precision-tapped nuts at one cycle, each nut being delivered to an individual collecting box so product of each spindle can be gaged independently.

Two size nuts can be tapped at one time. Maximum production is 9000 units per hour.

LOGANSPORT BUILDS NEW (Q34) MACHINE FOR PLANE ASSEMBLY

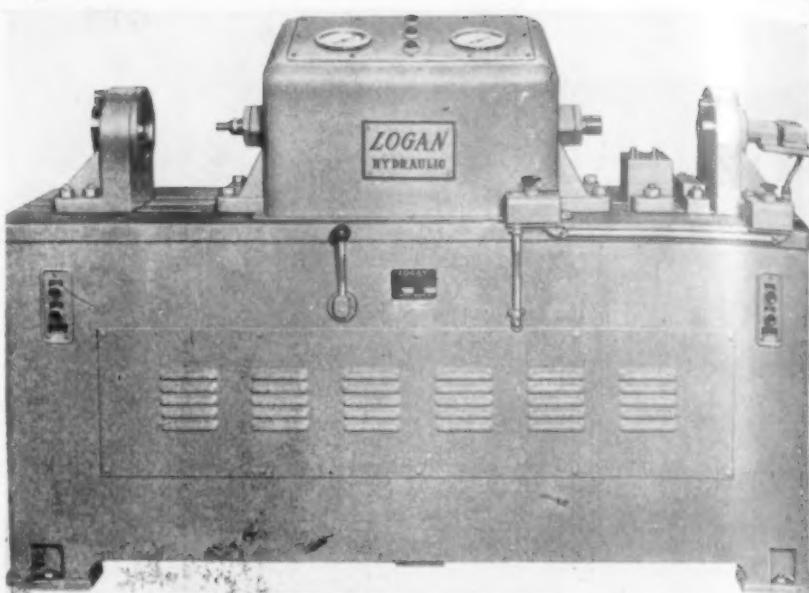
Developed to meet a special aircraft builder's problem, Logansport Machine Company, Inc., is building a hydraulic gaging and assembly press. The machine has dual functions; press fit assembly of a splined shaft into a splined hole of a disk, and disassembly at the end of a test run. The right hand part of the machine is for assembling and the left hand part for disassembling.

Three indicating lights show the type of fit obtained. Too close a fit will flash a warning and automatically stop pressing stroke. The press has two independent hydraulic systems, each consisting of a motor driven pump mounted on an oil reservoir, operating valve, pressure control valve and hydraulic cylinder.

Parts easily accessible.

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Hydraulic machine meets special customer problem

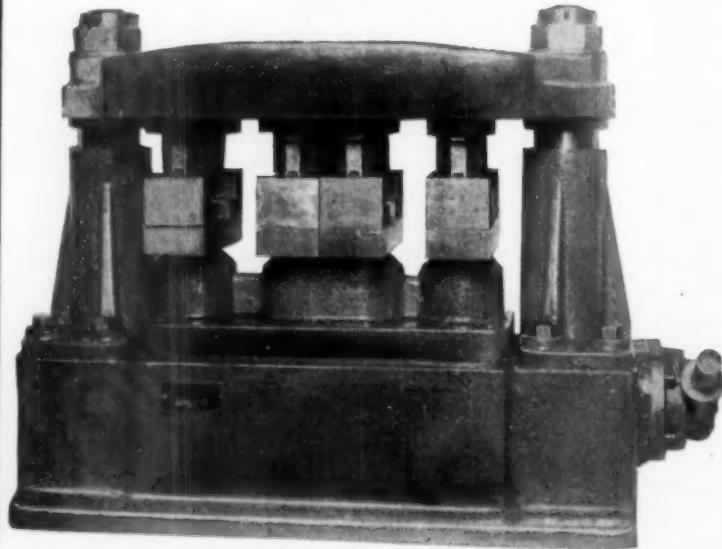
ROTARY PUMP DESIGNED (Q35) TO MOVE LUBRICATING FLUIDS

A low pressure, rotary pump, affording an efficient and economical method for pumping all liquids having lubricating properties has been developed by the John S. Barnes Corporation. The pump is said to be ideally adapted for use as a lubricating booster pump for

oil lines, gasoline dispensing pumps and for oil pressure systems on automotive equipment.

Capacity of the pump ranges proportionately from one GPM at 600 RPM to four gallons at 2400 RPM. It has high volumetric efficiency pumping low viscosity fluids.

(Continued on page 170)



STANDARD FIXTURES

SPEED UP TOOLING
REDUCE COSTS

AN LH TYPE FIXTURE TOOLED TO DRILL HOLES IN BEARING CAPS. LOWER EQUALIZERS PERMIT EQUAL CLAMPING ON ALL PARTS. PARTS ARE SQUARED UP TO HARDENED WEAR STRIPS UNDER TOP PLATE. TWO FIXTURES ARE USED ON AN INDEX TABLE.

SWARTZ TOOL PRODUCTS Co., INC.

13330 Foley

ASK FOR CATALOG 941

Detroit, Michigan

Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Chicago—Ernie Johnson

Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Houston—Engineering Sales Co.
Los Angeles—Production Tool Engineering

Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

A POST WAR REALITY

HIGH SPEED MILLING . . .

FOR

TOMORROW'S METALS

Experts agree that the "light metals" are about ready for the "big time." Working the "metals of motion" presents no problem if you know about methods already made possible by Onsrud high speed milling machines.

Here are some facts you should remember—and will need to use—when you set up for nonferrous metal milling. They point the proved way to lower costs and faster, better, production in the future.

Cutting characteristics of aluminum, magnesium and their alloys make high speed milling not only feasible, but desirable.

Aircraft parts, for example, are being produced by high speed milling methods that re-

duce production costs drastically without sacrificing quality or accuracy.

To realize the full potentials of high speed milling takes more than an increase in cutter RPM of conventional machines. It calls for equipment with high speed traverse and unusual operational flexibility.

High speed milling of nonferrous materials is a technique with whose development Onsrud Machine Works, Inc., has been intimately associated from the start. Out of that experience has already come the famous Onsrud Automatic Contour Miller to make high speed production milling of aluminum alloys a reality. Keep an eye on Onsrud while you are watching light metal progress.

ONSRUD MACHINE WORKS, INC.

3927 Palmer Street, Chicago 47, Illinois

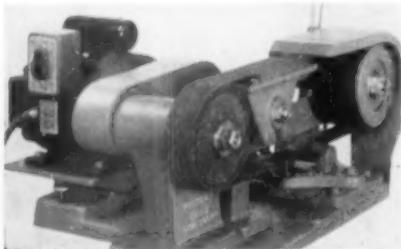
Manufacturers of Routers, Shapers, Automatic Contour Milling Machines and Related Portable Tools for Aircraft Production

The logo consists of the word "Onsrud" written in a bold, italicized, cursive script font. The letters are thick and have a dynamic, flowing appearance.

MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

NEW EQUIPMENT

Outstanding feature is the patented spur gear tooth form. Tooth construction eliminates excessive sliding and reduces slippage of the fluid to a minimum. Positive displacement of fluid is realized through design that permits each tooth to completely fill its mating space as the gears mesh.



Bench type belt grinder

**RUGGED BENCH GRINDER (Q36)
OPERATES FREE OF VIBRATION**

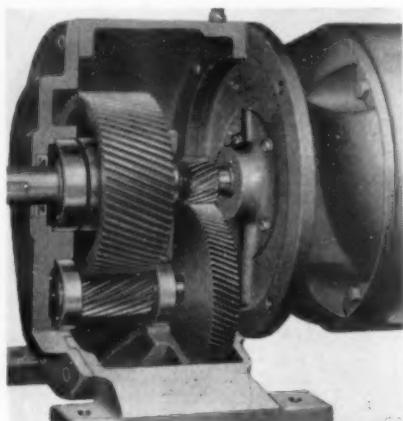
A new model bench grinder has recently been added to the Porter-Cable Machine Company line. Employing an endless metal cutting abrasive belt $2\frac{1}{2}$ " x 60", the grinder operates on a one horse power motor. Design provides a flat bed grinding area $2\frac{1}{2}$ " x 8", backed up by a soft resilient contact wheel, adaptable for grinding all types of metal.

The whole unit is ruggedly constructed and builder claims it operates free of vibration. The grinder is especially suited for burring gears, polishing, weld grinding, flat and edge work, generating

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ing radii, removing flash and cleaning up. The model is classed as BBS Bench Type Belt Grinder.

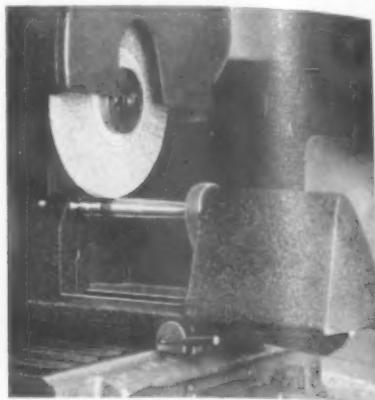


Rugged speed reducer

**COMPACT SPEED REDUCERS (Q37)
ADDED TO TOOL DRIVE DEVICES**

Cullman Wheel Company announces addition of a streamlined, sturdy speed reducer ranging from $\frac{1}{2}$ to 10 H. P. Ratios up to 5:1 on single type and 20:1

on the double. The reducers use 1200 or 1800 RPM motors to produce a wide selection of speeds. Helical pinions and gears supported on ball bearings are designed to take liberal overloads.



Tool supplements grinders

**STRONG ATTACHMENT ADDS (Q38)
UTILITY TO SURFACE GRINDERS**

Strong Manufacturing Company devised the Multi-Purpose Grinding Attachment in reply to their war production needs for making their surface grinders do more work and to eliminate necessity of using large cylindrical grinders on small work.

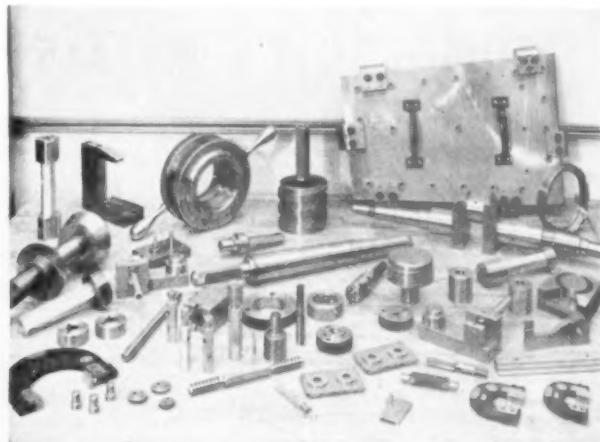
The attachment may be tilted forward or backward to any angle. The general angle is set approximately by

(Continued on page 172)

All in the DAY'S WORK AT MERZ

Paraphrasing the old adage—if you want a job well done, ask an experienced man to do it for you!

This company is experienced in designing and manufacturing the widest variety of gages, tools and fixtures, special and "pilot model" machines and parts for war, commerce and industry. Our equipment is as new as the market affords, our facilities are thoroughly modern in every respect,



and our craftsmen are among the most skilled in the business.

If it is made of metal, MERZ can design and make it for you.

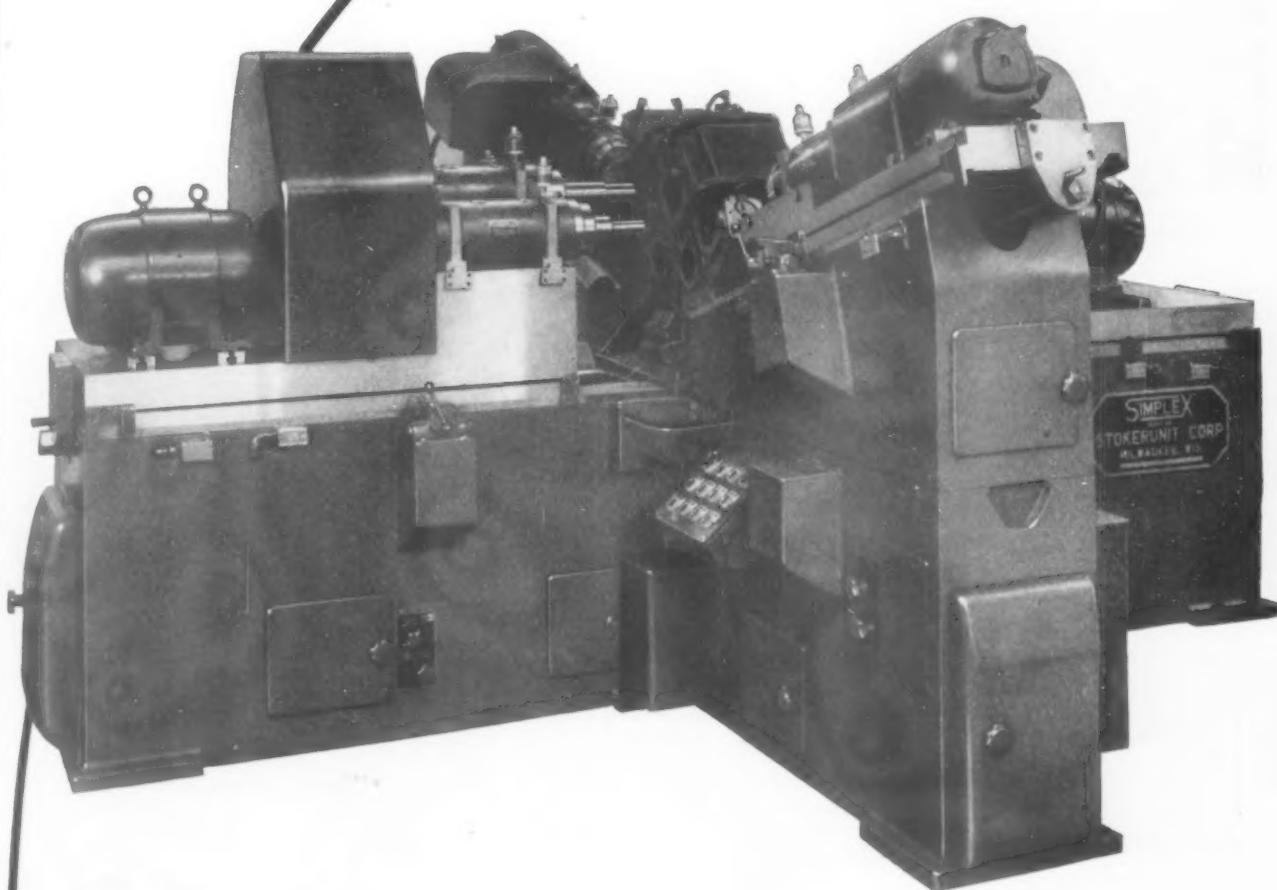
Standard plug and ring gages shipped from stock. Send for literature "Four Spheres of Service" which gives complete information.

MERZ Engineering Company
INDIANAPOLIS 7, INDIANA

SIMPLEX

New designs and new materials, fashioned to tolerances never before possible, must be finished rapidly and economically. The new way—a machine with precision spindles, precision spaced, performing all important and correlated operations at one setting of the piece. It may be the answer to your problem now, next month or next year.

This **SIMPLEX 2U 4-way 10-spindle Precision Boring Machine** has made a production item of an intricate gear case which had been practically a tool-room job—yet it has sufficient inherent flexibility to permit it to be adapted to normal development changes as they occur.



Precision Boring Machines

S T O K E R U N I T C O R P O R A T I O N

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4528 West Mitchell Street, Milwaukee 14, Wisconsin

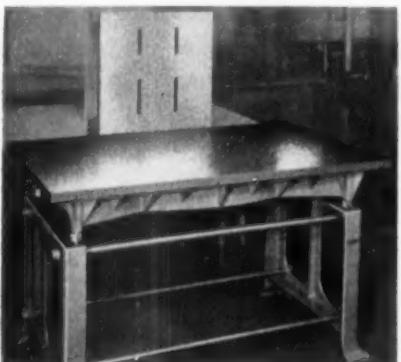
NEW EQUIPMENT

hand and a precision Vernier adjustment to exact angle. Ability to move backward and forward permits cutting angles in either direction without removing work from machine.

Two models are available, having 6" and 10" between centers. A precision indexing fixture allows grinding of flats, squares, hexagons, rectangles, octagons, etc. A few of the uses worked out to date include: shoulder grinding on cylindrical parts, circular form tools, plug gages, reamers and counter bores.

SPACE SAVING ADAPTION (IQ39) SHOWN FOR SURFACE PLATES

Barco Scraping Company offers a space-saving surface plate that can be clamped to a special table that gives a combination surface plate and angle



Surface plates are adaptable

iron. Both surfaces are hand scraped to .0002" tolerance. Clamping allows use of the entire surface plate.

SEGMENTED SHANKS CUT (IQ40) WEIGHT OF CARBOLOY GAGES

Having dual advantages of lighter weight and better balance, N. A. Woodworth Company is currently marketing a new type Carbolyg gage with segmented shanks. Claims for the gage are reduced operator fatigue and more accurate inspection.

Permanent bonding of cemented carbide bushings to steel shanks is a constant problem. Any loosening of the bond reduces useful life of the gage. Woodworth claims the segmentation compensates for differences in coefficient of expansion and assures a



Gage with segmented shank

trouble-free bond between the two metals.

A guide cap of shock-proof materials has been provided.

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Heat treating furnace

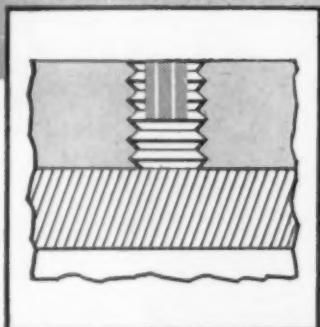
ELECTRIC FURNACE EMBODIES (IQ41) NEW PRINCIPLES OF DESIGNING

Providing temperatures up to 1850° F. and incorporating many new design features, a new electric furnace has been built by Thermo Electric Manufacturing Company for use in heat treating tools and dies and for other industrial uses.

Door arrangement of the furnace is interesting. Instead of being hinged at the bottom or suspended on a cable, the door is supported by two sets of parallel levers, so that it opens upward and out of the way. The door is prop-

(Continued on page 174)

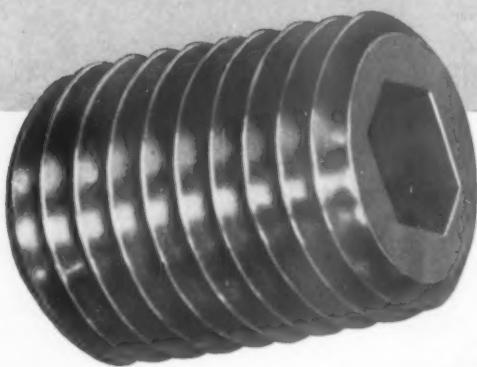
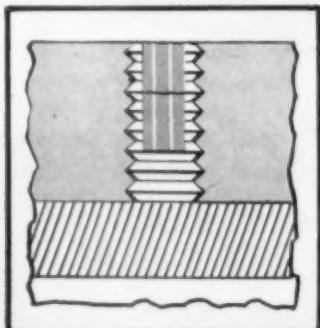
DESIGNED FOR Safety... BUILT FOR Strength



The advantages of hollow set screws include safety on revolving or moving parts, ease of assembly in confined places, and more compact construction.

Mac-it Hollow Set Screws offer these design features, plus great strength. They are heat-treated to resist upsetting of the point, rounding out of the hex sockets, and splitting of sockets at the corners.

The tremendous holding power of Mac-it Hollow Set Screws makes locking devices unnecessary in all but a few applications. In these cases, Mac-it Hollow Lock Screws are used like jam nuts to prevent any possibility of loosening.



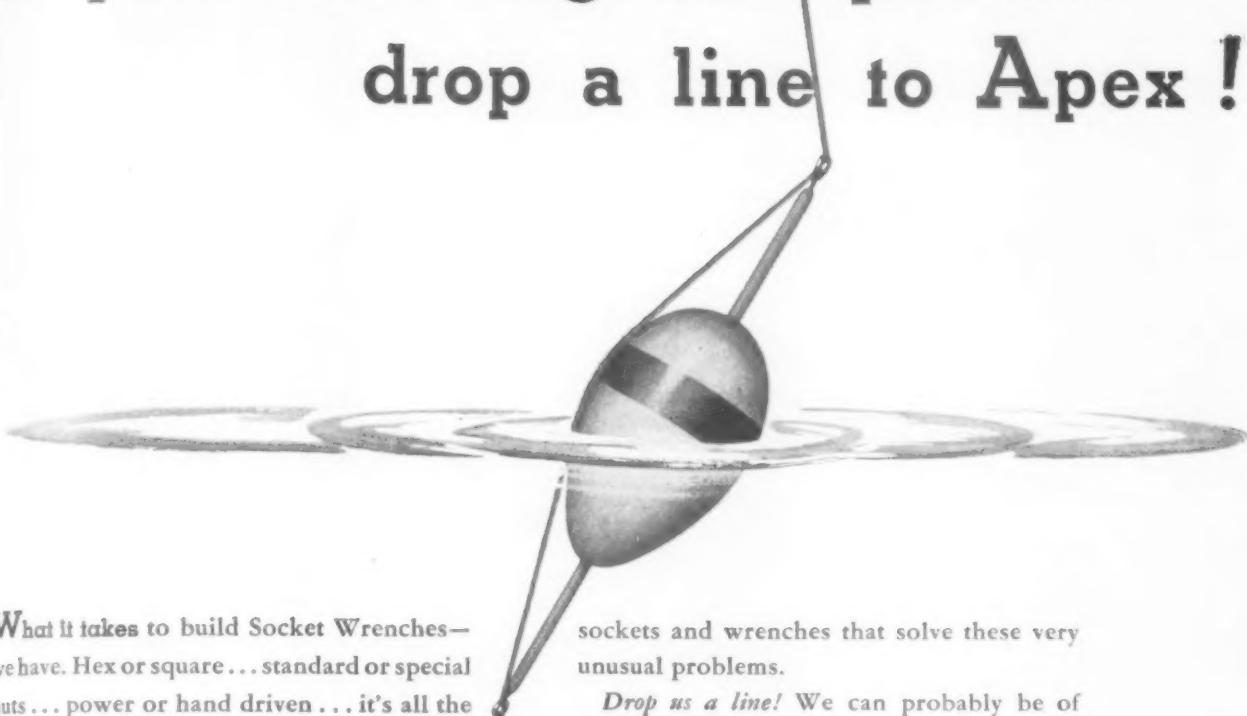
mac-its
PRONOUNCED
"MACK-IT"

OTHER MAC-IT PRODUCTS INCLUDE:
Socket head cap screws, Stripper Bolts, Hollow pipe plugs, Hexagon head cap screws, Square head set screws

4341

Strong, Carlisle & Hammond Company • Cleveland, Ohio

If you're fishing for specials drop a line to Apex!



What it takes to build Socket Wrenches—we have. Hex or square . . . standard or special nuts . . . power or hand driven . . . it's all the same to Apex. We're tooled up for speed and flexibility!

Some very unusual nut running problems have been put up to us. For most of these we have been able to design and build special

sockets and wrenches that solve these very unusual problems.

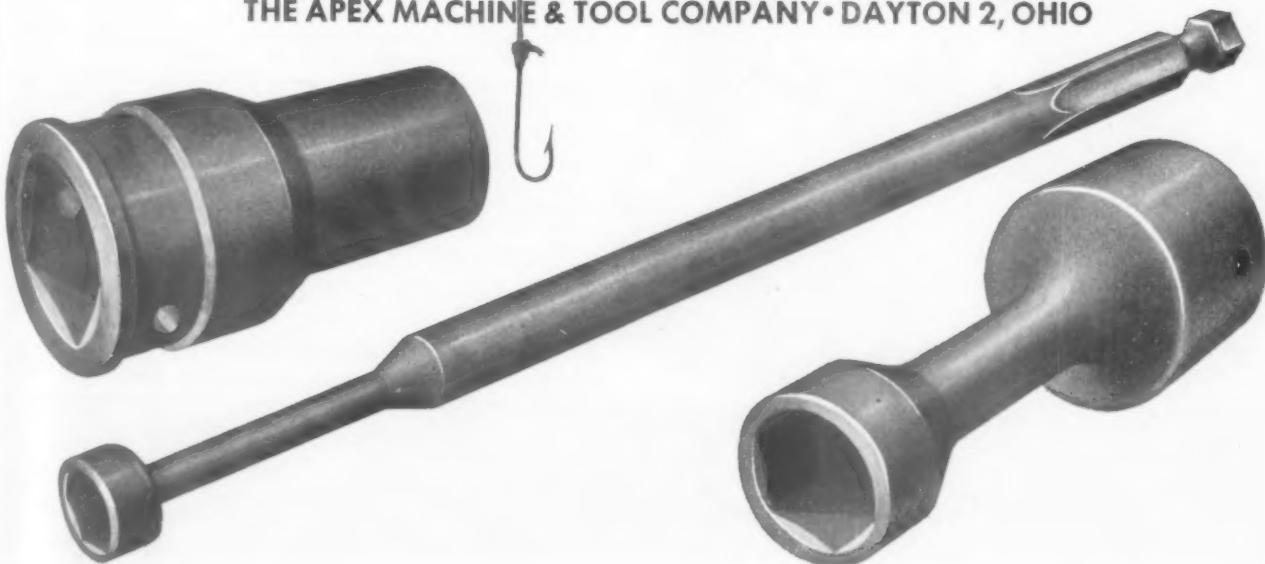
Drop us a line! We can probably be of assistance to you.

Apex also makes Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft and Commercial Universal Joints.

APEX

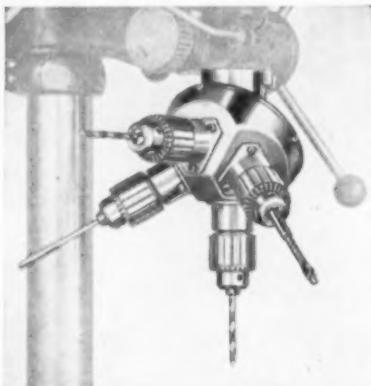
Socket
Wrenches

THE APEX MACHINE & TOOL COMPANY • DAYTON 2, OHIO



NEW EQUIPMENT

erly insulated and counterbalanced. Built either for 115 or 230 volts, it has a rating of 2000 watts.



Increases tool applications

**DRILL PRESS TURRET (Q42)
INCREASES CAPACITIES**

Add to your list of attachments a new turret produced by Chicago Drillit Corporation for use on a drill press. It is sold under the name Quadrill.

A precision built rotary device capable of holding four tools, the Quadrill can be indexed quickly by hand. This shortens the time formerly used to change tools in a single chuck.

Manufacturer claims it will do such work as drilling, counterboring, spot

facing, reaming and center drilling. Only the tool in working position rotates. Others are stationary for safety.

Claims are made for accuracy of the work produced on the turret equal to accuracy of the drill press itself. The entire turret is assembled to the quill of the drill press and is driven from the spindle.

**MAGNIFIER AIDS EYE
IN USE OF MICROMETER (Q43)**

Magnification of micrometer readings is obtained through use of the Magna-Eye available from Ameraco Industrial Specialties. The device is of unbreakable plastic, thoroughly transparent and concentrates light on readings. It fits over the barrel of the micrometer. Other advantages claimed are that it keeps the "mike" clean,



Makes readings easier

INFORMATION FREE

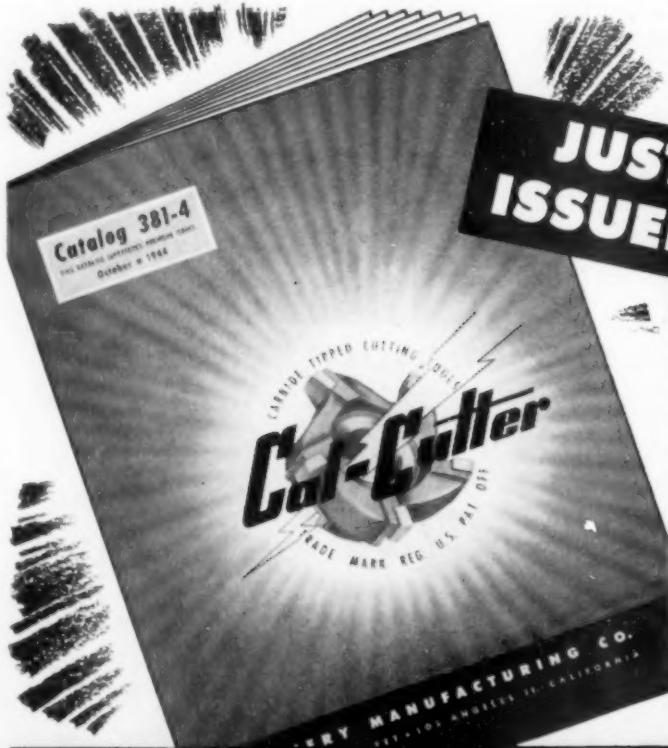
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**Produces 2750° F. heat
HIGH TEMPERATURE FURNACE (Q44)
ANNOUNCED BY HARPER ELECTRIC**

A complete line of high temperature furnaces with maximum temperatures of 2750° F. and operating temperatures of 2500° F. are announced by Harper Electric Corporation.

Built for laboratory or industrial use where materials are to be heated in an oxidizing atmosphere at temperatures above those attainable with metallic elements, they have many applications (Continued on page 176)



**NEW
JUST ISSUED! Cal-Cutter CATALOG
and Carbide Milling Manual**

Here is the latest and best information on carbide-tipped Cal-Cutters and carbide milling—and it's yours for the asking!

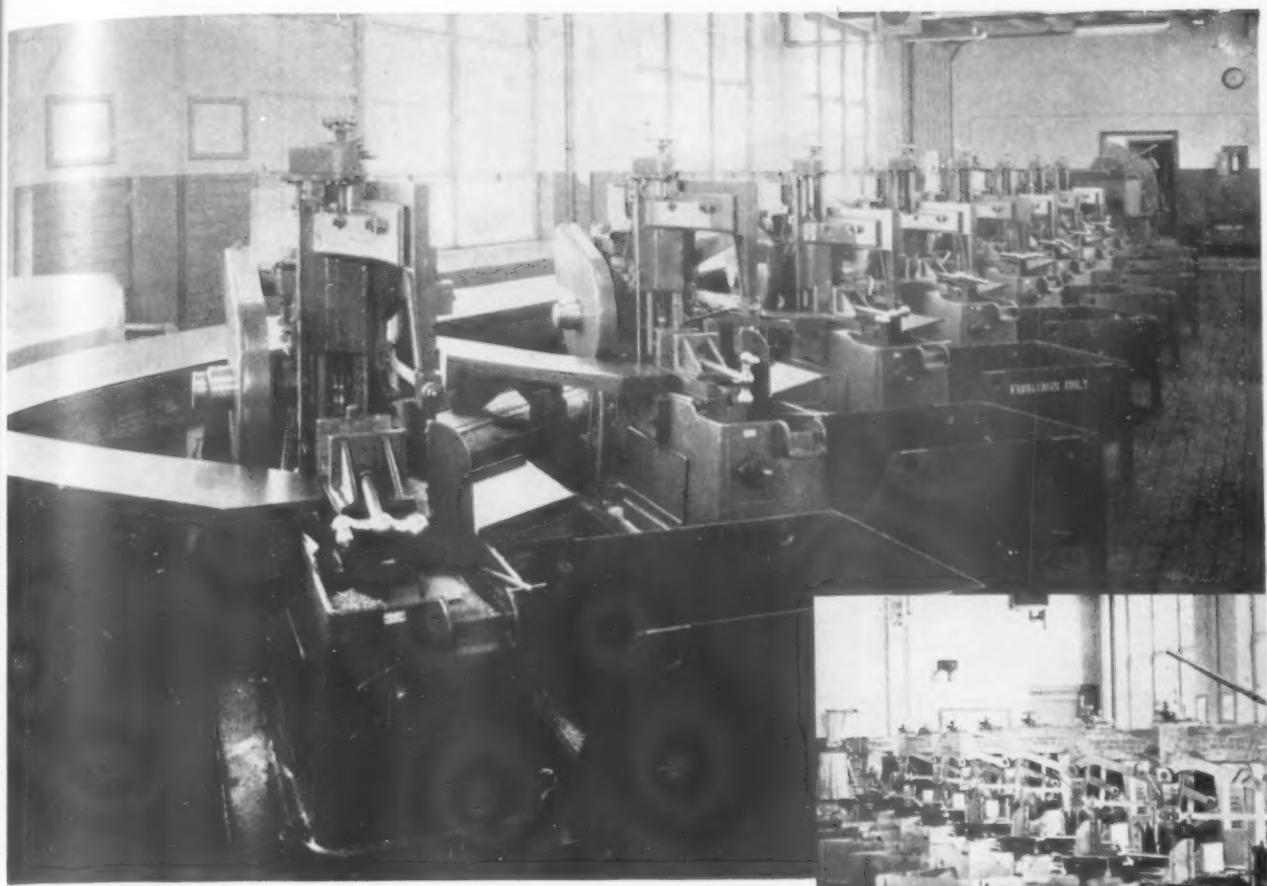
Contains 20 pages packed with data on cutter operation . . . cutter selection . . . speeds and feeds for various materials . . . based on the most recent authentic information available on carbide milling. And it provides sound, practical and easy-to-use charts for quickly finding spindle r.p.m., table feed and power required for practically every type and size of milling job—plus a dozen other important tips to help you get even more production from your Cal-Cutters! The most complete and comprehensive data on carbide milling ever published.

This Catalog supersedes all previous issues and brings you up to the minute on latest Cal-Cutter designs as well as providing information you're looking for on carbide milling. Your free copy of Catalog 381-4 will be mailed promptly—send for it today.

**MACHINERY MANUFACTURING CO.
1911 E. 51ST ST., LOS ANGELES 11, CALIFORNIA**



YOU CAN MILL IT FASTER—MILL IT BETTER—with CARBIDE-TIPPED Cal-Cutters



WHERE SPEED COUNTS MOST!

Increased steel production and more rigid inspection during the war has made it necessary for metallurgical laboratories to require hack saw machinery for specimen cutting of a wide variety of metals and alloys of almost any shape or size—in any condition of hardness.

The photos shown here illustrate how one large steel mill in the middle west has installed a battery of Marvel Hack Sawing Machines to crop and cut-off slices for metallurgical tests of large billets of tough alloy steels. This company, along with many other steel companies, has found that the Marvel Machine is the only one capable of cutting the hardest alloys fast and economically. The Marvel is the most universal cutting-off machine, built for heavy duty, continuous operation.

Marvel Saws increase production by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to "24 x 24". If you have metal sawing problems, Marvel Sawing engineers are available to discuss and analyze your cut-off work—to recommend methods and equipment.

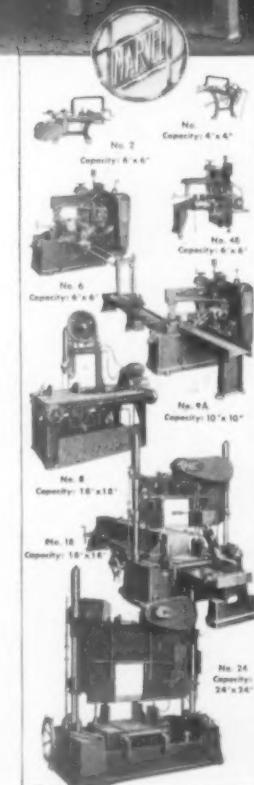
BUY FROM YOUR LOCAL DISTRIBUTOR

ARMSTRONG - BLUM MFG. CO.

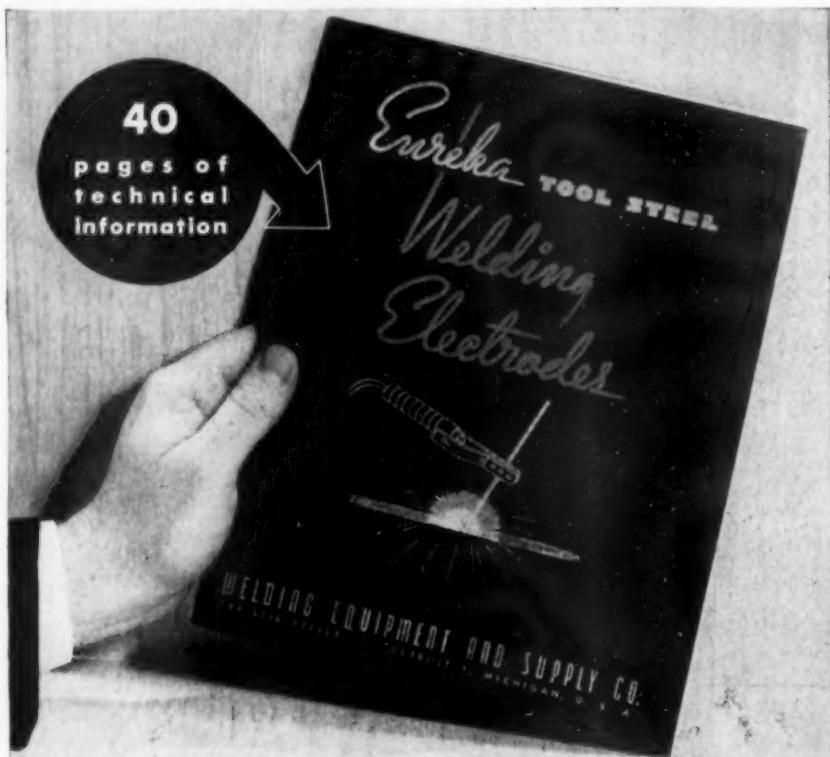
"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U. S. A.
Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL



YOU SHOULD HAVE THIS . . .



SOURCE OF VITAL INFORMATION It tells all about TOOL STEEL welding

★ This manual will help you save man-hours, conserve material and minimize production delays by outlining methods of repairing and compositely fabricating tools and dies, as well as correcting design and rectifying errors. Send for your copy of this manual today. It is fully illustrated with typical welding applications.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

EUREKA
TOOL STEEL
Welding Electrodes

Welding Equipment & Supply Co.
WELDING ENGINEERS WITH A COMPLETE SERVICE
223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN

LET'S DO IT Right

This sound slide film shows the proper procedure and application of tool steel welding. Write today for a free showing to your organization.

—NEW EQUIPMENT—

where special conditions are involved, such as rapid heating or heating in special atmospheres not injurious to silicon carbide.

INSTRUMENT MEASURES RPM (Q45) WITH ONE-HAND MANIPULATION

An altogether new form of tachometer, designed and distributed by Standard Machinery Company, is available for general distribution to time-study men, engineers, setup and maintenance men.

The instrument differs from all other devices in that it weighs but 5½ ounces and is of a size 2½" in diameter and



New tachometer available

permits one-hand manipulation. The recording in RPM is easily read without use of a timing or counting device. Readings are constant and record fluctuations. Scale is made up of black figures against an orange background.

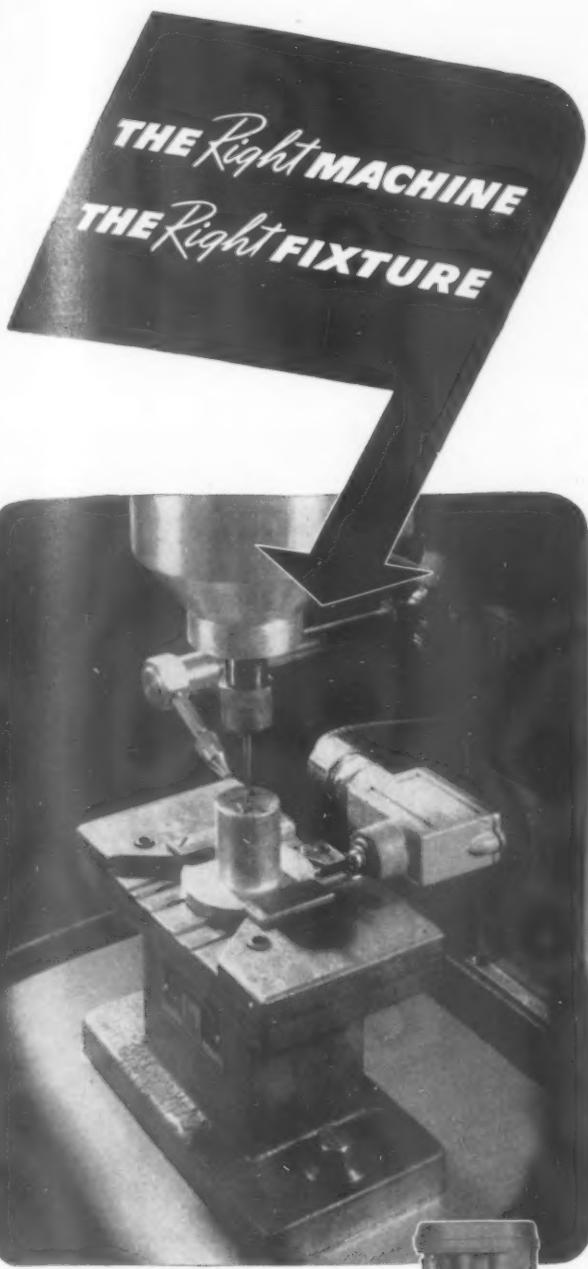
STREAMLINING PRODUCES NEW (Q46) TYPE STRAIGHTENING MACHINE

General Manufacturing Company is marketing a new streamlined type press for straightening, bending, forcing and push broaching. A solid column replaces the three posts, the drive shaft is ball bearing mounted and the auxiliary return brake prevents mechanical shock when the ram returns after power stroke. The builder claims these features permit unskilled operators to learn in a short time and reduces maintenance costs.

(Concluded on page 178)

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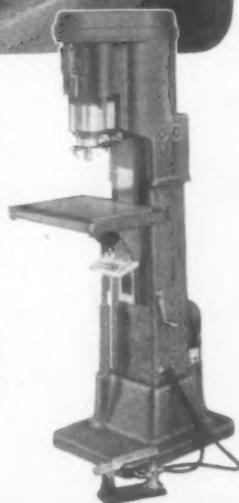
To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.



Insure continuous, trouble-free tapping production The HASKINS Way, combining Haskins AIR CONTROL with the right fixture. Add Piece Part Control and you approach completely automatic tapping. Placing the part in the fixture actuates a micro-switch—AIR does the rest. Each piece is tapped uniformly, precisely—faster than by any other method. For complete information on high speed tapping The Haskins Way, send for our latest catalog. R. G. Haskins Co., 2756 W. Flournoy St., Chicago, Ill.



NOVEMBER, 1944



POSTWAR

*an announcement
and a suggestion:*



ANDREW C. CAMPBELL DIVISION developments for postwar are well past the "imagineering" stage. The complete line of **CAMPBELL ABRASIVE CUTTING MACHINES** is being redesigned for higher efficiency—longer wheel life—greater adaptability—more automatic features. In short, **CAMPBELL** machines are being prepared for the more highly competitive production demands that lie ahead.

To illustrate: A new, completely automatic abrasive cutting machine is now a reality. The first model has already been produced—the second and third are "on the boards." By making possible the running of several machines by one operator, this machine will find many applications where it will speed production and cut costs.

We suggest this: Consider any cutting operation you may have in the light of new, improved methods of abrasive cutting. Write us about it. We may be able to show you a way to get into postwar competitive production—faster.

Tell us (1) the range of sizes, (2) kind of material, (3) length of cut-off pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, **CAMPBELL** engineers can recommend production procedure and work up cost sheets for you.

Campbell 
ABRASIVE CUTTING MACHINES

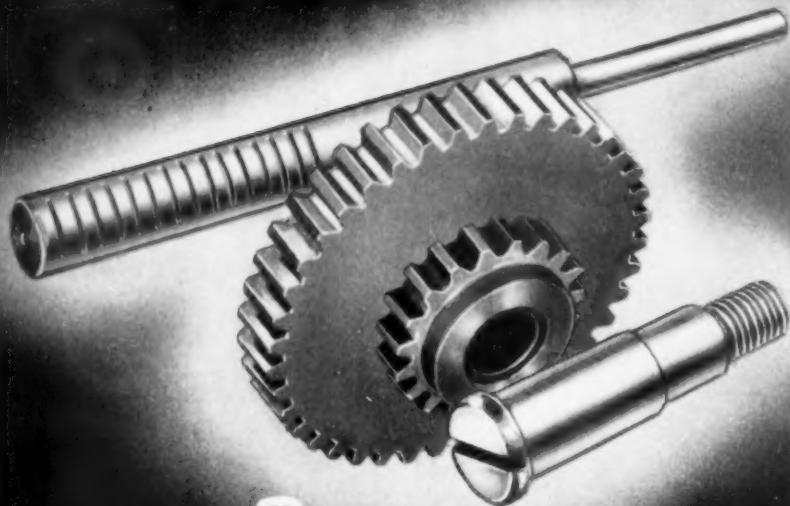
ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES



AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

COLD FINISHED .45+ CARBON OPEN HEARTH
SPEED TREAT STEEL



Perfect results from
FLAME or INDUCTION HARDENING
plus **FAST MACHINING**

FLAME or INDUCTION HARDENING
 of SPEED TREAT STEEL results in hardness of 60 to 62Rc. with water quench and 56 to 58Rc. with oil quench.

FAST MACHINING

SPEED TREAT STEEL machines consistently at 170 S.F.P.M. with excellent tool life and fine finish. Plants report production increases of 35 to 55% — scrap loss reductions of 50 to 75% — doubled tool life and actual dollar savings running as high as \$69 per ton of steel used.



BUY
WAR BONDS

*Our Metallurgists Are At Your Service.
WRITE FOR SPEED TREAT CATALOG*

Licensor
MONARCH STEEL COMPANY
 HAMMOND • INDIANAPOLIS • CHICAGO
 PECKOVER'S LTD., Toronto, Canadian Distributor

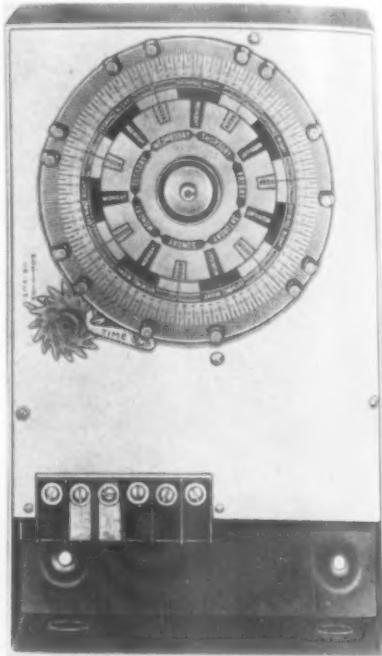
Licensee for Eastern States
THE FITZSIMONS COMPANY
 YOUNGSTOWN, OHIO
 MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

—NEW EQUIPMENT—

TIME SWITCH DEVELOPMENT (Q47)
 ALLOWS PRE-SET OPERATIONS

Heralded as a significant development in time switches, Paragon Electric Company offers the Series 700 dial time switch. The unit is for use in timing automatic heat, ventilating, lighting, pumping or flushing operations.

The switches are equipped with 6" calendar dials which make one complete revolution in seven days. Dial trippers can be independently set for different On and Off schedules for an entire week. Any day or days can be omitted.



Switch handles time setting

**SINE ANGLE PLATE AIDS (Q48)
GRINDING ACCURATE PARTS**

Claiming accuracy to four millionths inch, Florian Manufacturing Company offers a recently perfected sine angle plate to simplify checking and grinding of accurate angles from 0° to 90°. The guide is used with gage blocks and a table of sines. It is a hardened and accurately ground tool and sturdily packed in an instrument case.

**DOUBLE CYLINDER PUMP HAS (Q49)
PRESSURE-VACUUM CAPACITIES**

A two cylinder pump combining advantages of two separate single cylinder pumps as to services while retaining compact construction is announced by Leiman Bros. Inc.

The pump has ratings of 50 psi and for vacuum up to 28.7" mercury. One cylinder may be used for pressure and the other for vacuum or both may be used for either pressure or vacuum.

THE END

INFORMATION FREE
 For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

THE TOOL ENGINEER

Ever try
to
imagine an inch
divided into two-
hundred-thousandths?



*It's There, But
You Can't See It*

THAT IS A \pm TOLERANCE
OF

DUBLIFE REVERSIBLE PLUG GAGES

Finest gage-steel UPPCO-lapped to maintain such precision, demanded by today's work. Another BIG advantage: Both "Go" and "No Go" plugs in the same handle are reversible. When either plug wears, turn end for end, and you have a brand new gage.

ACCURACY WITH TIME SAVING — that's what it is!



Originators
and exclusive
manufacturers of
DUBLIFE Gages
and UPPCO finish.

Complete Pin Sets in
Cabinets. Also Number
and Letter Drill
sizes and Fractionals.
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prices.

Send for Complete Cata-
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UNITED PRECISION
PRODUCTS CO.

3517 West Belmont Ave.,
Chicago 18, Illinois

NOVEMBER, 1944



A PUZZLED Industrial Executive

There are many puzzled industrial executives today . . . men who are facing major problems, upon which depends the future. Men who are shouldering the responsibility of increased production, conversion, future planning. The men at Pioneer are trained and highly skilled in solving such problems—with RIGHT answers. Why not let them help you? You may require but one Pioneer man—or you may command the services of scores. Essentially, the men at Pioneer are a team . . . in which the individual abilities are combined to achieve common objectives. Pioneer is a highly developed organization . . . geared to help you solve any industrial problem . . . quickly and efficiently. Let Pioneer men share your responsibilities.

No Job Too Big—No Job Too Small



*An All-Electric
ADJUSTABLE-SPEED DRIVE*
FOR A-C. CIRCUITS
SPEED RANGES UP TO 16 TO 1
-SIZES - 1 TO 30 HP



- 1 DIRECT DRIVE. Lower cost, because fewer parts (no intermediate speed-changing device). Power is closer to where it is needed. Use less space. Streamline your machine design.
- 2 SPEED CONTROL CONVENIENCE WITHOUT LIMITATIONS. Place speed-changer and start-stop button at any convenient point to which a wire can be run. Control always within easy reach.
- 3 OPERATES ON A-C. POWER.
- 4 QUICK STOPPING.
- 5 SMOOTH, FAST ACCELERATION.
- 6 REVERSING.
- 7 SPEED-SETTING.
- 8 SLOW FOR THREADING and INCHING.

Get Reliance Bulletin 311 for details — and other advantages.

RELIANCE ELECTRIC & ENGINEERING CO.
1088 IVANHOE ROAD • CLEVELAND, OHIO

Sales Offices in Principal Cities

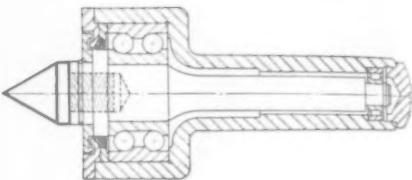


NOW
deliveries within
30 days
*on standard sets
and accessories*

Ford
Johansson
GAGE BLOCKS

Write for Catalog 16 to FORD MOTOR COMPANY
Johansson Gage Division—Dept. TE, Dearborn, Mich.

Rigid & Accurate



because the Red-E New Departure Ball Bearing Center runs on double row angular contact preloaded precision bearings. (No lost motion.)

Point ground after assembly assures accuracy.

Write for Catalog E 44

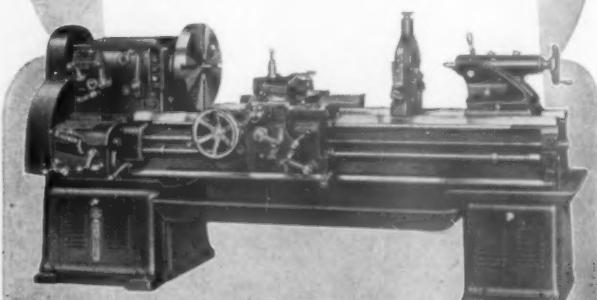
THE READY TOOL COMPANY
BRIDGEPORT, CONN.

Metalmaster

12", 14" & 16" LATHES

Offer: Infinite range of threads and feeds. Easy gear adjustment. Independent motor mounting. Short, direct drive. One control for all threads. Ample power for heaviest cuts. Automatic stop for feeds.

Catalogs sent on request. Write for yours!



The **BRADFORD MACHINE TOOL Co.**

MANUFACTURERS OF METAL WORKING LATHE; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

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FOR INDUSTRIAL OIL PURIFYING
Specify HILCO
 HYFLOW OIL FILTERS



HILCO Hyflow Oil Filters are used for filtering all types of industrial oils such as used for cutting and lubricating. Units are available for stationary use or portable operation for moving from one machine tool to another.

By keeping cutting and lubricating oils in good condition, oils are kept in service for an indefinite time and result in less down time, longer periods between tool grindings and better finished work. This means increased production.



Write today for free literature and see what Hilco operators are doing — then let us help you select a Hilco to take care of "That Particular Job."

OIL PURIFIER HEADQUARTERS

THE HILLIARD CORPORATION
 107 W. FOURTH ST. ELMIRA, N.Y.

Rawhide

The best "soft" hammers and mallets are rawhide — tough, resilient, long-lasting C/R mechanical rawhide. They strike effective blows without battering or marring . . . without fatiguing re-coil. They hold their true striking surfaces. Sizes and weights for every need. Hammers are malleable iron with replaceable C/R Rawhide insert faces.

Write for Catalog Sheets.



CHICAGO Rawhide MFG. CO.
 1393 ELSTON AVE. CHICAGO, ILLINOIS

HERE'S THE COLLET FOR HOT-ROLLED STOCK

• In Sutton Full-Floating Style "F" Collets, each jaw floats independently, comes to a full bearing on the stock and allows the collet to run as true as the machine spindle.

Patented Diamond Grip extends on to the tongue of the jaw, grips tightly with about two-thirds tension necessary with ordinary, single-piece collets, prevents slippage, reduces scrap, reduces strain on machine parts and tools.

Style "F" Collets are equally effective on cold-rolled stock and one set of the replaceable Style "F" jaws often outwears three standard collets.

Sutton Diamond Grip Collets cost no more than ordinary collets.

SUTTON TOOL COMPANY

Sturgis, Michigan

See our representative or send for Catalog No. 15.



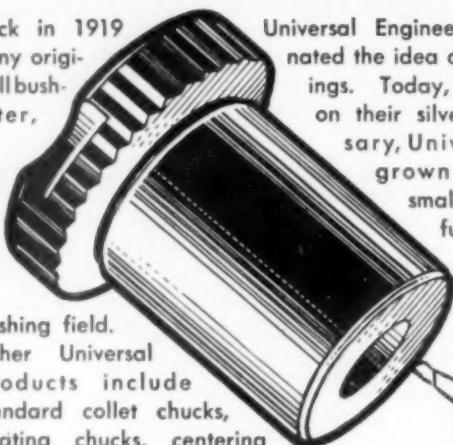
Patented
**DIAMOND
 GRIP**

HOLDS TIGHTER
 SELF-CLEANING

SUTTON Diamond Grip **COLLETS**

Universal Drill Bushings

Back in 1919
company origi-
nally drill bush-
ings, later,



bushing field.
Other Universal
products include
standard collet chucks,
floating chucks, centering
chucks, boring chucks, boring
bars, grippers and plungers.

Universal Engineering Com-
mended the idea of standard
bushings. Today, 25 years
on their silver anniver-
sary, Universal has
grown from a
small shop to a
full fledged
leader in the drill

Fighter Plane
Given by employees

20% Employees
Bond deductions

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

STAND-BY
for
DEPENDABILITY

*Specify TUTHILL GENERAL-PURPOSE PUMPS
for Long, Economical Service*

Low first cost and negligible maintenance have made the Tuthill Model C general-purpose pump a stand-by for dependability throughout industry. Simple in design, compact, and built for rugged service, this internal-gear rotary pump is ideal for handling non-corrosive liquids. It operates efficiently in either direction of rotation. Capacities from 1 to 200 g.p.m. at pressures up to 100 p.s.i. Direct-drive, belt drive, V-belt units and stripped models available.

Write for Model C Bulletin.

TUTHILL PUMPS are serving Army • Navy • Air Force
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939 E. 95th St. • Chicago 19, Illinois

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DIAMOND TOOLS

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CATALOG



• Complete line with
diamonds set in ma-
trix of WILLEY'S Metal,
permitting complete use
of the diamonds, be-
cause WILLEY'S Metal is
machineable.

New Catalog Now Ready

Catalog 41 covers WILLEY'S
Diamond Tools and Mechanical
Dressers. Write for your copy.

WILLEY'S CARBIDE TOOL CO.

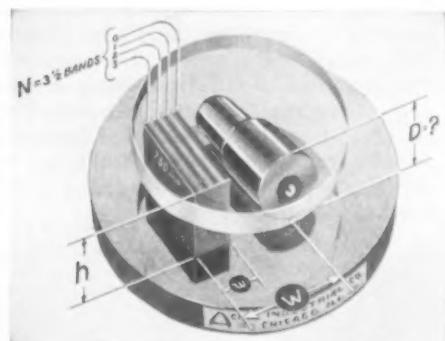
SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway

Detroit 1, Michigan

MEASURING A PLUG GAGE with LIGHT WAVES

using an optical flat, a toolmakers flat and a gage block



The formula is:

$$D = h + (.000012 \times N \times \frac{w}{w})$$

Substitute the actual values

$$D = .750 + (.000012 \times 3\frac{1}{2} \times \frac{1\frac{7}{16}''}{23/64''})$$

and get the answer

$$D = .750168 \text{ inch.}$$

It's just that simple!

Write for new, free Lightwave Measurement Booklet.



ACME INDUSTRIAL CO.

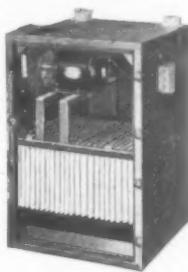
Makers of Standardized Jig and Fixture Bushings
208 N. Laflin St. MONroe 4122 Chicago 7, Ill.

DON'T
GAMBLE

with the DUST MENACE
Get TORIT PORTABLE DUST COLLECTORS

Put TORIT to work whenever you need to remove dust-laden air from hoods of grinding, cutting or polishing wheels.

Heavy particles fall into a tray beneath the bags—the finer dust is drawn to the filter bags and adheres to the outside of them. No dust gets inside so they are easily cleaned.



Write for the TORIT Dust Collector catalog giving full information and description of different size units.

TORIT MANUFACTURING CO.
281 WALNUT ST. ST. PAUL 2, MINN.

TORIT Dust Collectors
SELF-CONTAINED UNITS

Columbia TOOL STEEL

V-E DAY—

With V-E Day this good tool steel that made war time records will be ready for the new jobs and for doing old jobs better.



It pays to use
good tool steel.

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT

MAIN OFFICE AND WORKS

520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

NOVEMBER, 1944

Sizes and Shapes
FOR EVERY INDUSTRIAL NEED

COLLET GRIP

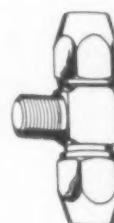
seals as it grips

TUBE FITTINGS



SINGLE NUT
COLLET GRIPS

—Illustrated in right-hand column—range in size from $\frac{1}{4}$ " to 1".



DOUBLE NUT
COLLET GRIPS

—Illustrated in left-hand column—range in size from $\frac{1}{4}$ " to 1".



No Threading, Welding or Soldering

Shown above are but a few of the wide variety of single and double nut Collet Grips—there is a size and shape for every industrial and hydraulic tube fitting requirement. Collet Grip's revolutionary design principle permits repeated use without distortion of threads—assembled or disassembled merely by tightening or loosening compression nut. And, because Collet Grip "seals as it grips," positive protection is provided against vibration leaks. Quick, easy, economical installation—without threading, welding or soldering.

Write for Catalog No. 43 which gives complete technical data



LOGANSPORT MACHINE CO., INC.

Fittings Division

902 PAYSON ROAD, LOGANSPORT, INDIANA



SCREW MACHINE CAMS for B & S MACHINES

Cams cut to your layout shipped within 2 to 3 days.

Set of 3 No. 00 Cams including blanks, cutting, heat treating — \$6.20 complete. Other sizes in proportion.

GEORGE L. DETTERBECK CO.
1871 CLYBOURN AVENUE
CHICAGO, ILL.



CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

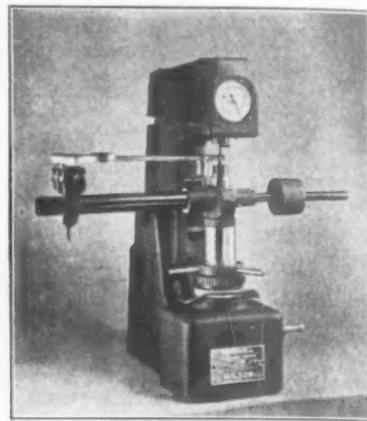
CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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"ROCKWELL" HARDNESS TESTER



Shipment within a few days of these enormously improved new models

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WILSON

MECHANICAL INSTRUMENT CO., INC.

"An Associate Company of American Chain & Cable Company, Inc."

FULL SPEED NOW—FOR WAR PRODUCTION, BUT HAVE YOUR TOOLING PLANS READY FOR THE GREEN LIGHT OF RECONVERSION



Your plant and our plant are working full blast to end this war quick! But we don't want to win the war and lose the peace.

You and A.C.E. can get together—NOW—on your future tooling plans. You can consult with our Engineering Department on future tooling needs, so that you can have your Hi-Speed or Carbide-Tipped Cutting Tools ready at the earliest possible moment.



In this way you can be sure to get back into civilian production as fast as permissible.

We have appointed a special division of A.C.E. Engineering Department to look after your reconversion plans. Write us today.



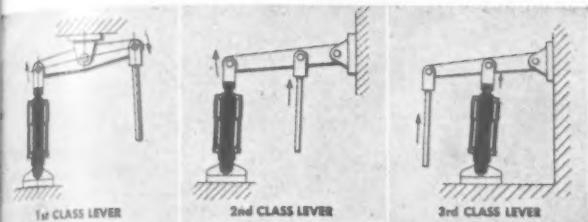
AMERICAN CUTTER & ENGINEERING CORP.
31751 Mound Road Warren, Mich.



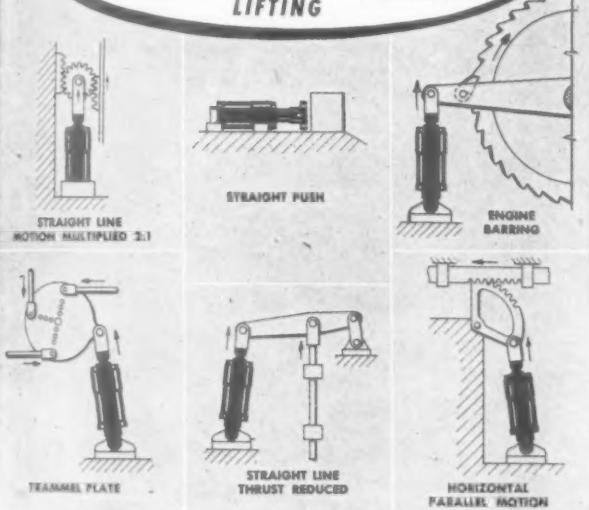
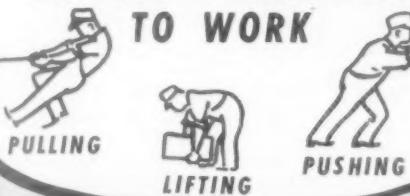
A.C.E. SPECIAL CUTTING TOOLS
HI-SPEED OR
CARBIDE-TIPPED

THE TOOL ENGINEER

Hanna Air and Hydraulic Cylinders



PUT THESE SKILLED MECHANICS TO WORK



• On 1001 jobs Hanna Cylinders simplify and improve operations—save time and labor—help increase production.

Where can you make use of Hanna Cylinder Power as suggested in these illustrations?

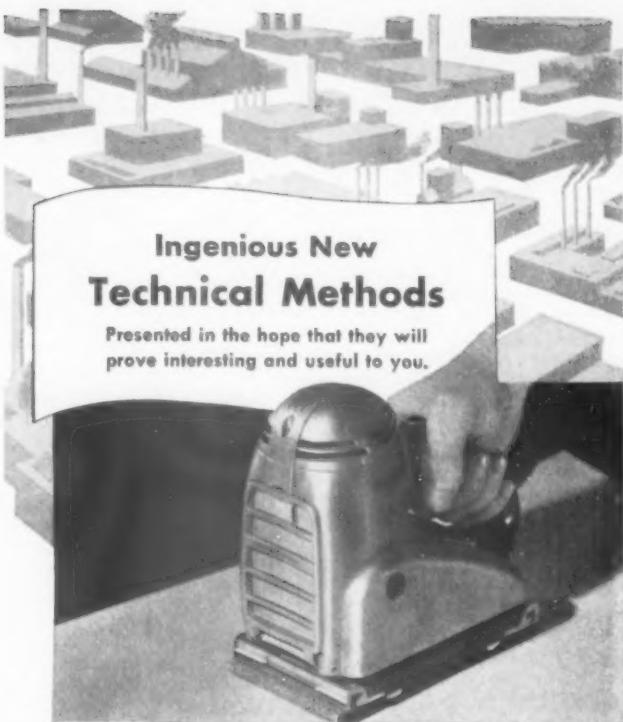
Write for Hanna Cylinder Catalogs No. 230 (low pressure cylinders) and No. 233 (high pressure cylinders).

HANNA ENGINEERING WORKS
1701 ELSTON AVENUE • CHICAGO 22, ILLINOIS
RIVETERS • CYLINDERS • VALVES • AIR HOISTS

NOVEMBER, 1944

Ingenious New Technical Methods

Presented in the hope that they will prove interesting and useful to you.



No Vibration in New "Orbital Action" Portable Electric Sander; Relieves Workers' Fatigue

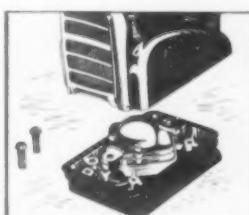
A boon to workers' nerves and health, this new "Orbital Motion" electric sander is actually vibrationless. A great saver of workers' energy as well as man-production hours, the sander can be operated easily in horizontal, vertical or inverted position with one hand. Compared to manual sanding, this machine achieves superior results at least eight times faster. It performs equally well on wood, metal or plastics.

Developed for war industry, this revolutionary new sander has done yeoman duty in this country's manufacturing plants and in allied maintenance and repair depots all over the world.

Wrigley's Spearmint Gum renders a real service to workers too—eases dry throat and relieves tension that brings on fatigue, leaving both hands free to stay on the job. The Army and Navy were quick to appreciate these benefits, that's why they are now shipping to our fighting forces overseas only, our entire limited production of Wrigley's Spearmint. Just as soon as we can supply the home front, too, industry will again enjoy the benefits of Wrigley's Spearmint Gum now proving so important on the battle fronts.



Easily-removed filter cleans air that cools motor—prolongs motor life and reduces maintenance costs.



Dustproof transmission synchronized to eliminate vibration. Oil supply lubricates for 100 operating hours.

You can get complete information from the Sterling Tool Products Company, 155 East Ohio Street, Chicago 11, Ill.

• NEW LITERATURE •

OF INTEREST TO PRODUCTION EXECUTIVES

(1156) Radius Dresser

A four-page insert for their tool catalog is announced by U. S. Tool & Manufacturing Company. The insert describes two new models of radius dressers. The two models covered are Model 45, adaptable to all radii up to $4\frac{1}{2}$ ", concave or convex and Model 124, an angle correcting dresser to $1\frac{1}{8}$ " capacity.

(1157) Master Tools

For those who do not already have one, Master Tool Company has available a catalog covering pneumatic chipping hammers, pneumatic sand rammers, pneumatic tool parts and a special section devoted to tool rebuilding.

(1158) Cutter Grinders

K. O. Lee Company has available a catalog of their universal cutter grinders. The 24-page booklet is handsomely illustrated. Text describes uses and attachments for each of their regular machines. Many machine setups are described.

(1159) Heat Treating

A new heat treating guide, which should prove useful to tool rooms, has just been announced by Carpenter Steel Company. By using the guide,

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

the heat treater is assured of controlling hardening behavior to exact specifications. At a glance the heat treater can find the following information for each steel: type analysis, forging heat, normalizing heat, annealing treatment, hardening treatment, furnace atmosphere and recommended drawing range.

(1160) Machine Tools

Davis and Thompson is circulating its new catalog of machine tools and micrometers. The catalog shows graphically engineering, manufacturing and assembly facilities. Also described are the Roto-Matic line and D&T tubular micrometers and standards. There is a section devoted to custom built equipment.

(1161) Tapping Troubles

Tapping operations involve many variables. Use of a check list for analysis of troubles can save time and ma-

terials. To provide an analysis, Henry P. Boggis & Company has just published their "Quick Analysis of Tapping Troubles". The guide lists in groups related troubles, causes and suggested remedies. Suggestions on proper use of taps, which can help prevent many usual difficulties, are included in the folder.

(1162) Hobbing Practices

Complete, attractive and authentic—these describe the new literature release of the Colonial Tool Company, Ltd., in their "Hobs and Hobbing", which is being currently circulated. Containing 48 pages of packed information, the booklet advances the cause of hobs in photos, diagrams, tables and text. A completely convincing argument for use of hobs to meet many maintenance and production requirements.

(1163) Grinding Facts

To popularize the newly-announced standard identification symbols for grinding wheels, and other bonded abrasives, The Carborundum Company has published "Grinding Facts", 136 pages of reference material. Included (Continued on page 188)



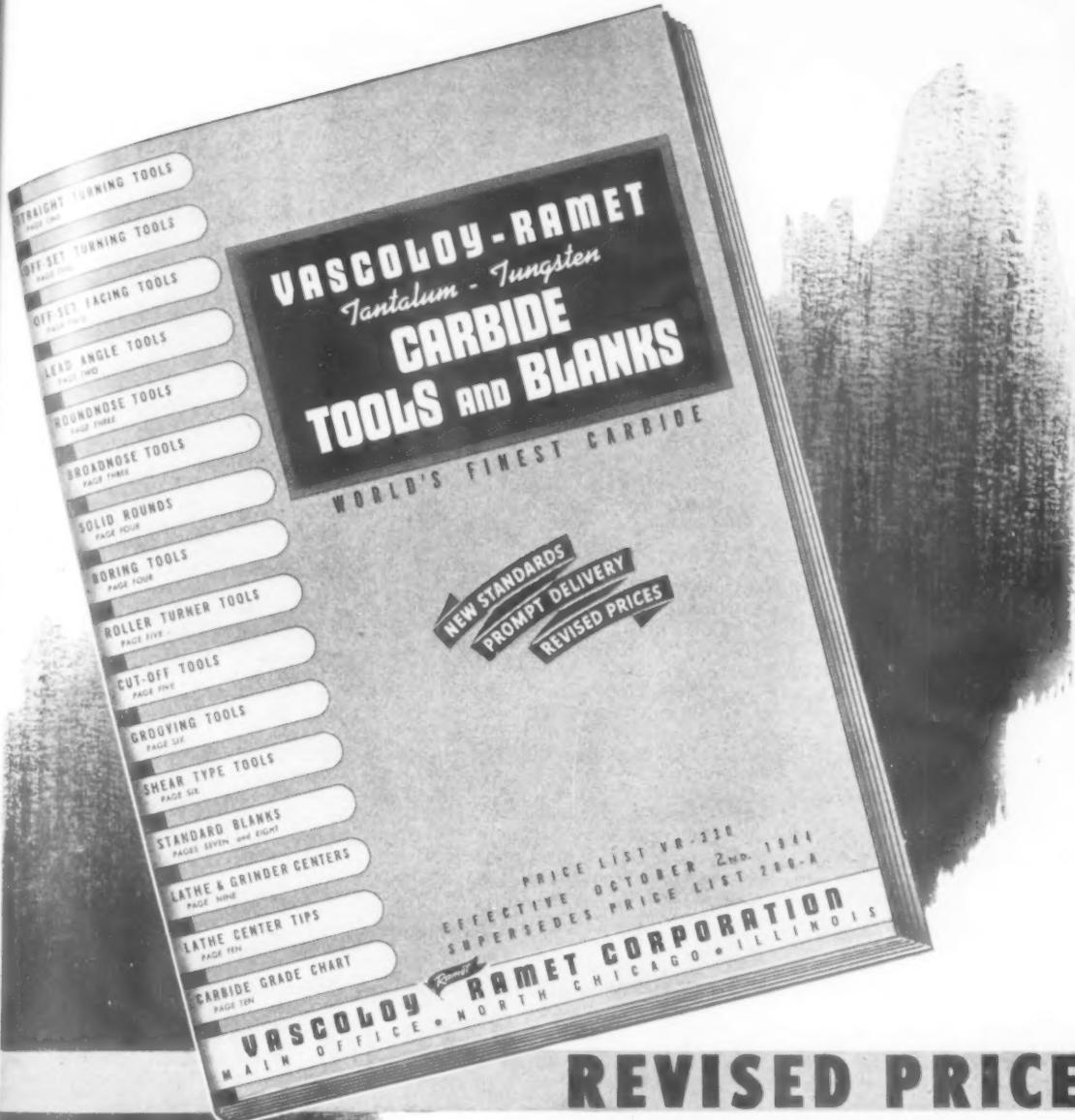
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COPY TODAY

Your Copy
of the
**NEW PUTNAM
TOOL CATALOG**
Is Ready!

The finest and most complete catalog of its kind ever produced! The entire line of standard Putnam End Mills, Reamers, Counterbores, Holders and other products—now totaling 1023 items—are listed with specifications and prices. Additional sections are devoted to special purpose tools and engineering data valuable to cutting tool users. Your copy will be sent without charge or obligation. Requests must be made on company letterheads.



PUTNAM TOOL COMPANY
2987 Charlevoix Avenue • Detroit 7, Michigan



REVISED PRICES NEW STANDARDS

**WRITE NOW FOR
PRICE LIST VR-330**

*World's
Finest
Carbide*

Every user of Carbide Tools can profit by the aid of this comprehensive new book. Revised prices became effective October 2nd. See the additional new standards on Vascoloy-Ramet Tools and Blanks. The superiority of this make is due to the inclusion of Tantalum-Tungsten, an extremely hard material that imparts a self-lubricating action which minimizes cratering or chip wear. Write today. Ask for Price List VR-330.

VASCOLOY RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • Sales & Service in Principal Cities

4471

NEW LITERATURE

is a complete explanation of the new marking symbols; a schedule of grading recommendations for general, thread, toolroom and diamond wheel grinding; description of each common type of grinding; table of recommended speeds and safety rules.

(1164) Metallic Fatigue

An ambitious contribution to the literature of metals is "Shot Peening and the Fatigue of Metals" which is available through the American Foundry Equipment Company. The material was written by H. F. Moore and contains results of his laboratory research in the field of shot peening to reduce fatigue of metals. The booklet is illustrated by microphotographs, charts and tables, and contains data never before published.

(1165) Speedy Milling

The George Gorton Machine Company is offering a 20-page booklet covering their super-speed milling machines. The publication describes five models of the adjustable Ram-Knee Gorton machine. This device is capable of spindle speeds to 12,000 R. P. M. Besides detailing parts and uses, the publication covers Gorton accessories. The booklet is one of six being circulated by the firm.

(1166) American Advertising

Occasionally there comes to an editor's desk a stimulating piece of work completely outside his field that he feels worthy of mention. Such a book-

INFORMATION FREE

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let is "American Advertising Today in Sweden, Spain, Portugal, Turkey, Egypt". It has been prepared by the Office of War Information. Manufacturers in foreign markets will find it interesting.

(1167) Countersinking Tool

Mercury Products Company has available a folder describing in detail their countersinking machine, for which they claim increases to 100 per cent in production, reduced labor costs and important space savings. They claim more than 3000 operations per hour.

(1168) Micrometer Care

Written in simple language, "The Use and Care of Micrometers" is being distributed by Sav-Way Industries. The colorful booklet explains in detail functions of various parts of a micrometer, tells how to use it and how to take care of it. Also included is a "do and don't" list to prolong useful life of the instruments.

(1169) Centerless Grinding

"Report", published by Cincinnati Milling Machine Company and Cincinnati Grinders Inc., contains an unusually concise story on centerless grinding.

Number 4 of the institutional publication devotes most of its space to a discussion of the forming process and illustrates text with typical applications. Very readable.

(1170) Power Transmission

Illustrating and describing operating principles, features, possible applications and engineering data, Sundstrand Machine Tool Company offers a new booklet, "Oil Power Fluid Motors". They characterize the motor as a simplified method of power transmission.

(1171) House Publication

George Scherr Company reports resumption of regular publication "Precise Production", a house organ that has been appearing intermittently during the past three years. Latest developments in precision manufacturing methods, inspection practices and shop procedures will be covered.

(1172) Surface Combustion

Two new bulletins just released by Surface Combustion are entitled: "Furnaces in the Steel Wire Industry" and "Applied Gas Chemistry of Prepared Atmospheres".

(1173) Sturdy Catalog

With an eye on the man who must use it, Sossner Tap and Tool Corporation has compiled and published a tap catalog which embodies many unusual features. Taking suggestions of cus-

(Concluded on page 190)

AMERICAN INDUSTRY PRODUCES MORE, FASTER, BETTER — WITH BOWSER EXACT LIQUID CONTROL

HOW A FAMOUS MANUFACTURER PROTECTS ENGINES DURING THE

THREE MOST CRITICAL MINUTES OF THEIR LIVES

Engines made by Minneapolis-Moline Power Implement Company are doing some mighty essential work these days—such as powering the famous heavy-duty MM Jeeps and the many MM farm implements working to feed us and our Allies.

So every minute of an MM engine's years-long life is important. But most critical are the first three minutes of the initial run, for 70% of engine wear occurs during those minutes.

Now—enter Bowser Exact Liquid Control. Minneapolis-Moline protects its engines during the test run, including those three most dangerous minutes,

with a Bowser Oil Circulating System that serves all test blocks.

Periodic losses from scored pistons and bearings have been completely eliminated. There's an important saving in oil, too. Previously, from 7 to 9 quarts were used in testing each engine. Now the oil loss is only about 60 gallons for each 300 engines tested.

Maybe your liquid control problem is different, but somewhere in your plant is a job that can be done better by a Bowser Meter, Filter, Proprietary Lubrication System, Oil Conditioner, Pump or one of the many other Bowser products. **BOWSER, INC., Fort Wayne 2, Indiana.**



**BUY
WAR BONDS**



Not only has Bowser's war production earned the Army-Navy E... Bowser equipment has helped earn it for scores of other companies.



*The Name That
Means Exact Control
of Liquids*

THE TOOL ENGINEER

THE

Carbide

AGE

AND ANOTHER RECORD... PRODUCTION AND THE NEW

Metalworking plants will need to eliminate "antiquated" methods and equipment, if they are to meet the postwar challenge of competition... better products, greater production at lower costs. Conversion to **WESSON** Carbide Cutting Tool methods is aiding war production tremendously, and, at the same time, setting the pace for postwar production. From week to week **WESSON** continues to establish new standards and make new records. For instance, here's another "FIRST" for **WESSON**:

With piloted carbide reamers specially designed and produced by **WESSON** tool engineers, aircraft valve-guide-bushings are being finish-reamed (for the first time) to a "thirteen micro-inch finish" ...an extremely high precision "mirror finish"...on large scale mass-production basis... multiplying production many times over, at less cost.

WESSON
COMPANY,

...TYPICAL OF POSTWAR COMPETITION IT PROMISES

Finer finish, higher precision, greater production resulted. Tool-life, too, is greatly increased. High speed steel reamers required resharpening every 60 to 100 bushings reamed...whereas **WESSON** Carbide Reamers finish 800 to 1200 bushings between sharpenings.

The problem was a tough one, heretofore unsolved anywhere in the tool industry, because the bushing material (soft aluminum bronze) heated up and closed in behind the tool. **WESSON** tool engineers, pioneers in the art of designing carbide tools, were called in because they are in the habit of solving tough problems. They did it again... meeting extremely rigid aircraft specifications. These same men are available today to aid you in any way they can. Phone, wire or write . . .

DETROIT 20, MICH.
(Ferndale Station)



NEW LITERATURE

tomers, Sossner has put their catalog in a heavy cover and used heavy dividers; employed a plastic staple that will permit the book to stay open at any given page and not lose sheets. Besides these advantages care has been taken to use readable type, clear illustrations and plenty of text and specification material.

(1174) Cleaning Nozzles

Chain Belt Company has just published descriptive literature on flat spray nozzles, showing applications in practically all industries where water is used in cooling, washing and cleaning operations. The folder also offers tabular information on capacities and installations.

(1175) Powdered Metallurgy

Hailed as the most complete commercial catalog ever compiled on powder metallurgy, Chrysler Corporation's Amplex Division announced publication of a new Oilite book. The 168-page catalog contains engineering data and general facts on production of bearings and machine parts from metal powders.

(1176) Hydraulic Cylinders

John S. Barnes Corporation has printed a folder describing their hydraulic cylinders to "increase flexibility of your new design with special cylinders". Illustrated are several different type cylinders of use in designing machine tools or industrial applications where special characteristics are desired.

NEW BOOKS

Plastics Molds by Gordon B. Thayer. American Industrial Publishers. Price \$3.50.

A second edition, new and enlarged, containing 20 chapters and an enlarged section on nomenclature of plastics molding. In adding to his work, the author has called upon experts for contributions. These, plus wider use of illustrations and diagrams, all conform to the original intent of keeping complicated mechanical procedures in simple and understandable language. A complete coverage of its field.

* * *

Plastic Working in Presses by E. V. Crane. John Wiley & Sons. 540 pages. Price \$5.

This is a third revision of this excellent work on plastic working of metals and non-metallic materials in presses. In the enlarged revision the author takes notice of advances in the expanding range of engineering materials and has added three complete chapters, as well as expanding earlier titles. The broadened view includes plastic materials of non-metallic composition.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

The author approaches metallic, organic and ceramic materials from a common focus and demonstrates that all follow simple rules, rather than becoming more complex. This interesting approach is carefully worked out. Should prove especially interesting for postwar engineering planning.

* * *

Diamond Tools by Paul Grodzinski. Anton Smit & Company, Inc. 379 pages. Price \$5.

A compilation of industrial diamond literature aimed at promoting economical working methods. The author, an English technical editor, had as an objective a furtherance of mutual knowledge and an exchange between industries that formerly operated somewhat independently. Beginning with distribution, production and qualities of diamonds, he carries through technical uses, bearings, hardness testing, truing and dressing of grinding wheels, diamond cutters, machining of glass and artificial stone, rock drilling, engraving, fine wire drawing and abrasive dust. The volume represents a valuable foundation for collection of various experiences made in the industrial application of diamonds, and the utilization of such information in interests of both manufacturers and consumers. It is significant that the author cautions that the diamond should be applied only where it can operate economically and obtain results which no other material can achieve. A valuable survey text.

THE END

AMES No. 22A **UNIVERSAL DIAL TEST INDICATOR**

Mechanics like the AMES Universal Test Indicator No. 22A because it is small and compact, easy to set up and adjust, can be used on numerous testing jobs, and with Hole Attachment can reach internal surfaces and places that are hard to get at. Packed in deluxe wooden box.

B.C. AMES CO.
WALTHAM, MASS., U.S.A.

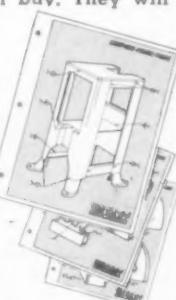


THINK
in Terms of
Arc Welding
When You Think of
Reconversion

...but
COMPARE
HOBART
Performance
Before You Buy Any
Arc Welder.

Have you thought about using more arc welding in your post-war production? More and more manufacturers see the value of arc welding for producing vital war materials . . . they know what it can do. We at Hobart value their judgment . . . not only from the standpoint of more arc welding . . . but for the type of welding equipment they will buy. They will compare all welding machines . . . feature for feature . . . and their decision will be Hobart "Simplified" Arc Welding.

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Designs for Arc
Welding"
Initial series
FREE!
Write today!



HOBART
One of the World's Largest Builders of
Arc Welders"



FOR FASTER CHECKING AND STRAIGHTENING

Built with Stationary or Traveling Ram . . . capacities up to 10 and 25 tons . . . so sensitive and accurate that a shaft may be bent .001". Pressure gauge, indicating ram loading . . . adjustable dial indicator shows amount of shaft run-out in pre-loaded, fully loaded, and unloaded positions.

Flexible, sensitive control by rotary control valve operated by hand lever.

An infinite range of loading up to capacity as lever is moved from 0 to maximum displacement. Push button control of hydraulic unit. Work table, 60" or 108" long. Available attachments include checking rolls, spring loaded centers, adjustable anvils and indicator. To increase production speed, an adjustable stop collar limits the stroke of the ram.



Faster, EASY TO USE

Has a "natural hand control" . . . as easy to use as a hand scraper. Left hand serves as guide to the blade . . . right hand controls the stroke. Pressure of left hand controls depth of cut, but forward cut requires no back-breaking labor. A slight forward pressure on cylinder with right hand starts swift, smooth forward stroke which can be regulated from nothing to 3½ feet . . . 60 feet per minute, reverse speed 90 feet per minute. Operator can work at a steady rate without tiring as ¼ h.p. motor does heavy cutting. With this machine one man can do the work of several. The Anderson Power Scraper, mounted on an elevating truck is easily moved to any location. Machine may be plugged into electric lamp socket and be ready for use. In scraper housing directly across from motor is a scraper blade grinder . . . a convenient, speedy means of resharpening scraper blades without leaving machine.

ANDERSON BROS. MFG. CO.

Anderson
ROCKFORD, ILL. U.S.A.

BUY MORE
BONDS

WRITE FOR
BULLETIN 1110

NEW NASH-ZEMPEL SPOT FACER AND COUNTERBORE

Has Removable, High-Speed Cutter Blade for Long Life and Extra Efficiency

Cutter blade can be utilized almost its entire length. Cutting edge always has a fixed position eliminating adjustment of machine stops after grinding. Pilot drilled and tapped to hold different sizes



of bushings. Many other exclusive features not found in ordinary Counterbore and Spot Facer tools. Made in 41 standard sizes. Write for circular on details.

FEATURES—Removable Cutter • Maximum Cutter life • Cutting edge fixed • Chip clearance in bar • Permanent chip clearance • Cone nut centers cutter • Cutter replaceable • Provision for pilot bushings.

NASH-ZEMPEL TOOLS

DIVISION OF J. M. NASH COMPANY

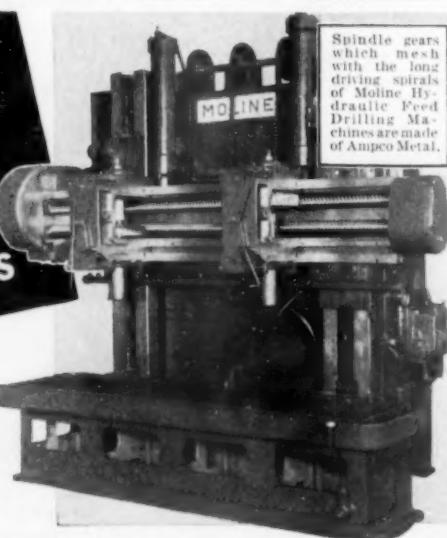
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**Protection
against
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breakdowns**

... provided by
parts of wear-resisting
Ampco Metal

Protection of highly-stressed parts against wear, impact, fatigue is an important point to check in the specifications of machines you buy. Over 90 leading machine tool makers — like the Moline Tool Company, Moline, Illinois — guard against costly failures with parts



of Ampco Metal. This remarkable aluminum bronze alloy has controlled physical properties that give it several times the life of ordinary bronzes. Be sure you get it in your new machines. And insist that replacement parts for your older machines be made of durable Ampco. Write today for File 41 of Engineering Data Sheets.



Ampco Metal, Inc., Dept. TE-11, Milwaukee 4, Wis.

**THIS MACHINE TAPS
1 $\frac{1}{4}$ " HOLE IN STEEL
EVERY 20 SECONDS**



• Shown in the plant of the Edward W. Daniel Company of Cleveland, this high-speed automatic Cleveland Tapping Machine is tapping 1 $\frac{1}{4}$ " diameter, 2 $\frac{1}{2}$ " deep holes in forged steel turnbuckles 300 percent faster than they have ever been tapped before—and is making taps last longer in the bargain!

• Back of this record is the principle of the lead screw, which controls the speed of the tap and the pitch of the thread being cut with absolute precision. Lead screw control (1) steps up tapping speeds, (2) improves thread accuracy, and (3) reduces tap wear and breakage. Cleveland Tapping and Threading Machines will tap class 3 threads on a production basis, and have tapped as many as 10,000 holes with a single tap.

Users of this machine enjoy many additional advantages. Why not write and learn what they are?



You'll find a lot of useful data in "Guide for Production Tapping." Send today for FREE copy.





**"LOW REJECTION RATE,
thanks to MICRO-CHEK"**

says F. A. SMITH
Manufacturing Co., Inc.

Priced
from
\$9.75
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"Our Trico Micro-Cheks hold close tolerances on parts turned on lathes — especially where machine is of light construction and the operator may apply so much pressure against the lathe stops that the piece is turned too small," says the F. A. Smith Manufacturing Company, Inc., of Rochester, N. Y. "In these situations, the Micro-Chek is a visual aid to the stop. The results are quick, positive operations and a low rejection rate . . . Very useful where inexperienced operators must be employed . . . sturdy, easy-to-read . . . register accurately."

Speed inspections in YOUR plant with TRICO MICRO-CHEK Comparator Gages, now in use in more than 3600 war plants —on machines, on inspection lines. Send for booklet which illustrates many applications.



MICRO-CHEK
TRICO PRODUCTS CORP.

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Chicago Rivet AND MACHINE CO.
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TUBULAR AND SPLIT RIVETS IN ALL RIVET METALS

NOVEMBER, 1944

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REID Hand Feed Surface Grinder No. 2C

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Product for Over
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Agents in all Principal Cities Throughout the World



ENGINEERED LIVE CENTERS

A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications — we will see that your job gets set up with the right Live Center. Standard shanks with Morse taper carried in stock.

STURDIMATIC **TOOL COMPANY**
5218 Third Avenue
DETROIT, MICHIGAN
LIVE CENTER

HANDY ANDY

Says —

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

WELL, here we are, the 12th. Semi-annual history and a bare six months between us and our 'teens. Truly, the A. S. T. E. has become a prodigy, a young giant in the industrial arena. And now, the worst of our growing pains over, and a record of achievement of which even our elders might be proud, we'll toughen our sinews for the work that lies ahead.

Post-impressions of the Syracuse meeting tend to strengthen my confidence in the Society. In the past, we may have made mistakes, but they have been mistakes of judgment, not of the heart. The mind may have erred, but not the heart.

In that respect, the A. S. T. E. is unique among engineering and industrial societies, in that it is rooted in friendliness and good fellowship. We'll try to keep it that way, growing stronger in faith in one another, welding the north and the south, the east and the west, into a powerful force.

Syracuse, a really beautiful city, smiled a welcome as the tool engineers

convened. The local committee, headed by likeable Steve Urban, had done a swell job of arrangement.

Even the seating arrangement at the Directors' meeting was an improvement over previous sessions. The meeting itself was streamlined; more business went over the board, and with neater dispatch, than I have previously witnessed.

Doug Burnside has completely vindicated my previously expressed faith in his ability. A clear and logical thinker, he has shown outstanding executive ability. For that matter, the entire executive slate — Burnside, Briner, Sargent, Peirce, Singer, Johnson and Eaton—is outstanding, the right men in the right place and at the right time.

Of the Directors, veterans Young, Curtis, Orchard, Mozeen, Jones, Gamble, Schmit, Radermacher, and Holmer oozed the confidence engendered of long experience, Irwin Holland laying down the law with judicious gravity. Newcomers Dawson and Douglas, from over the Border, had the

aplomb of seasoned statesmen. With Len Singer in the Exec. Com'tee, Canada is ably represented.

Art Denis, known to most of us, displayed usual enthusiasm — incidentally, kept me up 'til 3 A. M. a/c some important business. (He didn't show up). Ed Berry, Hayden Shearer, Howard Volz, Ken Jasper and John Lapham feeling their way. Oh, it takes time to get the hang of things! Detroit's ch'man Grant Wilcox pinch hitting for Ed Goodfellow. Didn't get to meet Ernest Seifert (I think I know that guy) or W. C. Fields. Wonder does he look like his movie namesake?

Also missing from the scene were Floyd Eaton and Clete Briner, the latter, however, confined to his room because of serious illness. Clete has been an indefatigable worker in the Society's behalf, and there is a limit to human endurance. I join his host of friends in wishing him a speedy and complete recovery.

The streamlining of the Society debated pro and con, with Frank Martinell gently applying the brake of caution. Yet, the changes are long overdue, and the O. P. Com'tee has done an Herculean job in bringing it to its present stage of development. In my opinion, it deserves unanimous acceptance.

Roy T. Bramson, long term past ch'man of the New Chapters Com'tee and for the past 10 years publisher of The Tool Engineer, awarded a life membership in recognition of outstanding service. From the middle where I've been these many moons, I wish

(Concluded on page 196)

MAINTAIN "ORIGINAL - CUTTER" SHARPNESS ON THE

Waltham

CUTTER SHARPENER

No machine is better than the cutting edge of the tool it uses. Tools that are sharp are economical — they require less power — produce more work — maintain required tolerances — produce a better finish.

The Waltham Cutter Sharpener is designed to **keep** cutters sharp, and to do it economically and accurately. This machine will sharpen such tools as those used for gear cutting and thread milling, circular form tools, straight fluted hobs and multiple cutters, etc. It can be run at peak efficiency by semi-skilled operators after a minimum of instruction.

If you have tools 2" in diameter, or less, which must be ground radially or with rake angle, it will pay to get further information on the Waltham today.



EDWARD BLAKE COMPANY

Please send me Bulletin No. 344 which describes the Waltham in detail.
T. E.

Name.....
Company.....
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BLAKE TAP GRINDERS — FILTAIRE PORTABLE
DUST COLLECTORS — AMERICAN TOOL
HOLDERS — BLACK DIAMOND PRECISION
DRILL GRINDERS — WALTHAM
CUTTER SHARPENERS



3 distinct values in WEBBER GAGE SERVICE

1. VERSATILITY — Webber offers 3 sets of Standard Gage Blocks to meet every manufacturing need from tool room to assembly line. These consist of the 84A and 84B containing blocks in sizes from .050" to 4.000"— the 43A and 43B containing 43 blocks in sizes from .100" to 4.000" an ideal set for the tool room and small shop — and for measurements requiring thin blocks Webber offers the 38A and 38B Sets containing 38 blocks in sizes from .050" to 2.000".

2. WIDER RANGE UTILITY — In every set of No. 84 blocks is a .10005 inch block which provides approximately 250,000 measurements as compared to the average 125,000. Also included are two wear blocks for use where gage blocks come in contact with the work. Thus you get longer life and greater utility from Webber gage blocks.

3. INSPECTION SERVICE — Webber offers every facility for checking any make of gage block and replacement of worn blocks where desired. Webber Gage Company will take in your old blocks and check each one for size and report individual errors for a very nominal charge. Webber will also make 10% allowance on purchase price of new blocks for any replacements required. Experience has definitely proved that replacing worn blocks is far superior to any reconditioning plan and more economical for the user.

Prompt delivery is assured on the following Webber Gage Sets:

Set No. 84A—\$350.00 Set No. 43A—\$185.00

Set No. 84B—\$235.00 Set No. 43B—\$150.00

Set No. 38A (Thin Blocks) \$195.00

Set No. 38B (Thin Blocks) \$155.00

Set No. 14A (Angle Blocks) \$450.00



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MCCROSKEY *Jack-Lock* MILLING CUTTERS



RANGING from 3" to 20" in diameter and fitted with high-speed steel, cast alloy, or carbide tipped blades, McCrosky face mills, end mills, half side and staggered tooth milling cutters meet every requirement. Each is a typical McCrosky tool, giving users the advantages of McCrosky's many service-proved features, including the patented Jack-Lock blade locking device.

Conceived and perfected by McCrosky engineers, the "Jack-Lock" gives inserted blade tools the strength and rigidity of solid tools,—yet permits quick and easy release of the blades for adjustment, re-grinding or replacement.

Specify McCrosky — leader for 40 years — for "Standard" milling cutters, or "Specials" that do 3, 4, 5 or even more related boring, counter-boring, facing and reaming operations at the same time, increasing production and cutting costs.

Send for a copy of the
McCrosky No. 16-M
Milling Cutter Catalog. It gives full details.



MCCROSKEY

COST
CUTTING
TOOLS

TOOL CORPORATION

MEADVILLE, PA.

Designers and Manufacturers of
Jack-Lock MILLING CUTTERS Block Type BORING BARS
Wizard CHUCKS AND COLLETS
Super Adjustable REAMERS Turret TOOL POSTS

—HANDY ANDY SAYS

(Concluded from page 194)
both Roy and the Society success in their respective ventures.

If I could only mention the names of all I met... But, space forbids. However, you're all remembered, even the boys hither and yon to whom I sent greetings by mutual friends. I like to meet the boys, am at once exalted and humbled by the overt and sincere expressions of friendship. There's something in the smile of the greeting and the clasp of the hand.

I wish, however, to extend my personal thanks to Al Sargent, Ray Morris, Doug Burnside, Brad Purce, Len Singer, Irv Holland, Vic Ericson, John Thomas, Geo. Metz and Jim Frederick for the fine assortment of guns—an open frame Colt, an Ashton, a Spfld. and English shotgun—they donated to my collection. I'm dedicating the lot to their memory. Thanks a lot! From Eric Crawford, of Canada, a box of Canadian cigarettes, personally autographed. It goes with my A. S. T. E. mementos.

At the banquet, Van Norman's Jim Scott entrenched himself solidly in the hearts of his fellow tool engineers. Here is a man who, starting from scratch has climbed to the pinnacle in his profession without losing touch with the man in the ranks. He is their spokesman, their champion; he is typical of the modern industrial leader.

He expressed confidence in America's future, but it was a confidence based on conviction, not on enthusiasm. Aside from the industrial angle, of which he spoke with authority, he espoused a stronger Americanism, said that the average American takes our country too much for granted; it takes the foreign born to appreciate the full greatness of this land of ours. Well, Jim Scott was born in Scotland, and I in Sweden, and we should know. America has been good to us, as it has been good to all who have adopted the Stars and Stripes as their own flag.

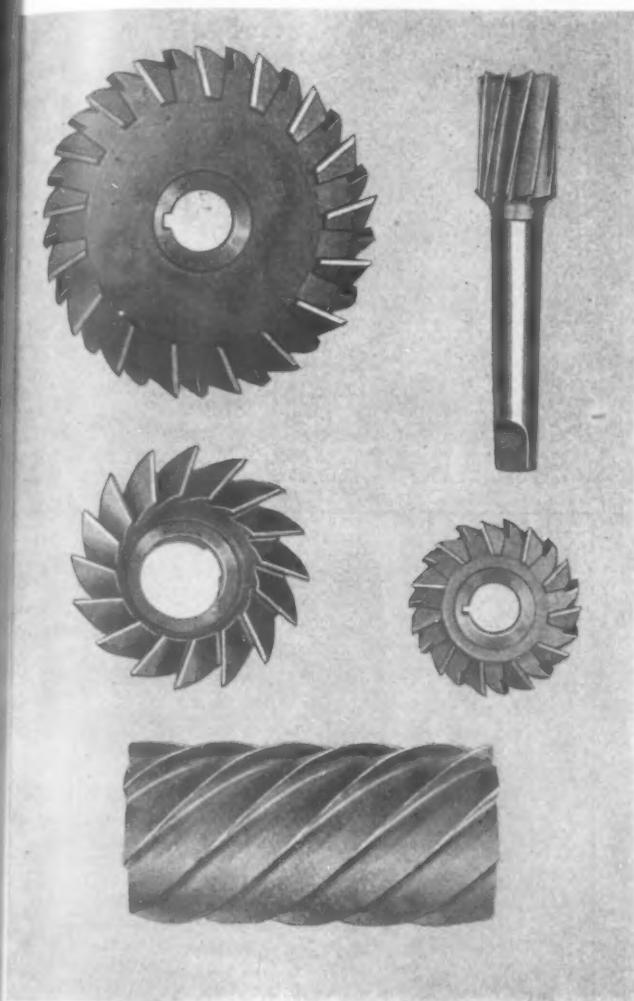
Gadding through a sporting goods store, ran into an old timer—Harry Empson by name—who is evidently a member of Syracuse Chapter. How it happened I can't exactly recall, but a chance remark about a highwall Hepburn kindled mutual interest. The upshot was that he invited me to his home, where he has set up a model shop. There, I spent a delightful hour, admiring fine gun scopes, models of new inventions and the gages and dies for the manufacture of many vital war accessories, all his own handicraft.

The man is one of a passing breed—the old time, all around mechanic who achieved precision long before the microinch was dreamed of, and who is satisfied with nothing short of perfection. They're not making him like any more, yet, he and his kind will live long in the pages of America's literature, even as the West lives and becomes the more glamorous with the passing years. His kind has helped to make America great.

And now, my space is up; I bid you au revoir.

THE END

A SIMPLE LOW-COST WAY TO REDUCE TOOL COSTS AND INCREASE PRODUCTION



- Manufacturers are now concentrating on Production. Anything that interferes with, or lessens efficiency, or waste, is a serious matter.
- Manufacturers know that high-speed tools represent a big investment and that their replacement costs are high. Selling them for scrap exacts a big toll in tool costs and also essential steel which they are pledged to save.
- In most plants, recutting of high-speed tools the Eastern method is a must. It keeps the tool crib full of sharp tools. It keeps mechanics efficient. It helps to produce the maximum in production.
- This makes for a definite savings in high-speed tool costs to the extent of approximately 50%. Labor and material costs are reduced. It also helps to turn out work faster and more efficiently.
- In many ways, Eastern Recut or Converted high-speed tools helps to turn lost time into more production.

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

NEW MILLING CUTTERS FROM OUR STOCK OR YOUR OWN STANDARD CUTTERS
CAN BE QUICKLY CONVERTED TO SPECIAL CUTTERS



EASTERN CUTTER CORPORATION 30-32 Littleton Ave., Newark 7, N. J.

Chrome Plant **MASTER CHROME SERVICE INC.**, 5709 Herman Ave., N. W., Cleveland, Ohio





WHEELS THAT LEND WINGS!

Faster, better BURRING, FINISHING, POLISHING operations (as on the close-tolerance parts illustrated) are multiplied many-fold in industry by Brightboy . . . versatility unheard of in finishing operations. The soft rubber, binding the evenly distributed abrasive, does it. Ask your distributor or a Brightboy service representative how Brightboy can do your usual — and unusual jobs — present and planned-for. And ask for Brightboy prices, catalogs and production data.

BRIGHTBOY
INDUSTRIAL DIVISION
Weldon Roberts Rubber Co.
Newark 7, N. J.



Removing
burrs, polish-
ing base of
elbow tube.



WELDON ROBERTS
Brightboy

Accuracy lasts longer with
new J-83 Gage Block Set!



TWO wear blocks of tough tungsten carbide protect the surfaces of the 81 alloy steel blocks. That's why the Jansson J-83 set of precision gage blocks stays accurate longer. Makes 120,000 gages in steps of .0001" from .200" to over 12". Skilled Jansson workmanship assures accuracy to .000008", .000004", or .000002".



Write for free copy of Jansson's 60-page "Handbook of Precision Measurement." Enthusiastically praised from coast-to-coast. For precision gage blocks, calipers, height gages, sine bars, tri-square, and special gages see Jansson, "The House of Precision", first.

JANSSON GAGE COMPANY
19208 GLENDALE AVE. DETROIT 23, MICHIGAN

Magni-Ray



The new illuminated magnifier will aid in solving your inspection problems. Used for inspection and examining work for burns, flaws in workmanship, surface defects, cracks in castings, blow holes, imperfect welding seams. Light shines on work, no reflection in eyes of operator. SPEED-UP INSPECTION WITH MAGNI-RAY.

MADE IN 2 MODELS
Model A with 2" lens complete with stand \$18.50
Model B with 2" achromatic lens, complete with stand \$27.50

GEORGE SCHERR CO., INC.

418-B Broome St.
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Faster TAPPING AND REAMING



By reducing set-up time, the Ziegler Floating Holder makes it possible to get production under way much more quickly than with ordinary holders. The reason, of course, is easy to understand. By automatically compensating for inaccuracies in spindle alignment amounting to as much as 1/32" radius, the Ziegler Holder makes it unnecessary to spend as much time in making a set-up as is required by ordinary tool holders. Try it and see! The man-hours you save will pay for it many times over in the course of a year.

W. M. ZIEGLER TOOL CO.
1920 Twelfth Street Detroit 16, Mich.

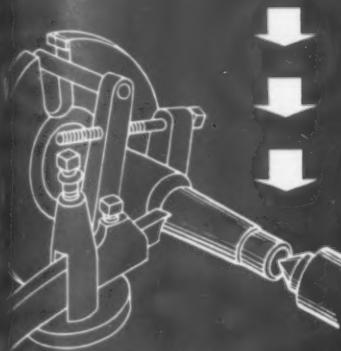
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ROLLER DRIVE

• WRITE FOR CATALOG •

FLOATING HOLDER
for Taps and Reamers...

THE TOOL ENGINEER

FOR
FREEDOM
FROM
FRICTION



on the
**DEAD
CENTER**

DIXON'S LATHE CENTER GRAPHITE LUBRICANT... combines lubricating flake graphite with an extreme pressure lubricating compound. It possesses almost super-film strength. As a result of these advantages, it reduces the chances for overheating, reduces wearing or scoring of dead centers, steady and follower rests and jack screws.

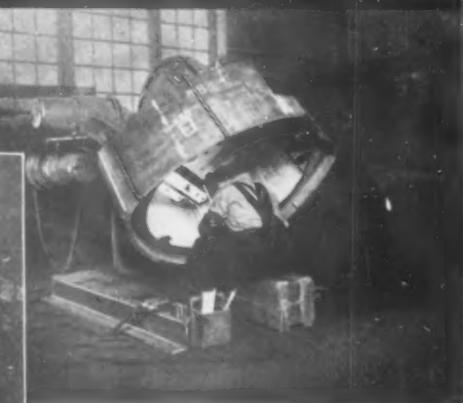
Assures more accurate work.



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Lip and Pressure Gun Grease • SlipStik
Gear Lubricants • Waterproof Graphited Grease
Auto-Marine Grease • Industrial Oven Lubricant
Graph Air Guns • Lathe Center Graphite Lubricant
Welding Rods • Belt Dressing (Contains no Graphite)

NOVEMBER, 1944

C-F POSITIONERS



In Any Welding Operation It's
"Position" That Counts

Production welding usually means working on top, bottom and on all sides of the weldment. It means a "quick change" of position should be possible for greater time saving, more efficiency, lower costs and greater safety to men and materials. With C-F positioners a welder can quickly position even the most cumbersome weldments at the press of a button, without crane help or handling crews. With just one set-up of the weldment, he can position it easily, speedily and safely, all alone. He can rotate it a full 360° at variable speeds from 0 R.P.M. up, tilt it to 135° beyond horizontal, and can weld, downhand, all sides surfaces and angles in one set-up with larger rods and fewer passes. All C-F positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance and all are adjustable for height.

Write for Bulletin WP-22

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BENDER

NO DIES!

**"DIE-LESS"
DUPLICATING**



SHEAR

**"DIE-LESS"
DUPLICATING**

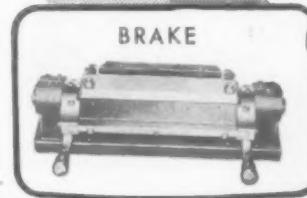
might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines—Shears, Brakes, Benders—when used as a continuous, integrated production process.

The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies is avoided, deliveries speeded up.

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"DIE-ACK-RO"



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DUPLICATING**

The DI-ACRO System of
METAL DUPLICATING
WITHOUT Dies

A. S. T. E. DOINGS

• National A.S.T.E. Headquarters: 1666 Penobscot Bldg., Detroit 26, Mich. Telephone C.Herry 8082. National Officers: (1944-45 term): President, D. D. Burnside; 1st Vice-President, C. V. Briner; 2nd Vice-President, A. M. Sargent; 3rd Vice-President, W. B. Peirce; Secretary, E. V. Johnson; Treasurer, F. W. Eaton; Assistant Secretary-Treasurer, L. G. Singer; Executive Secretary, A. L. Potter.

• For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 1666 Penobscot Bldg., Detroit 26, Mich.

• Senior initiation fee is five dollars. Dues eight dollars per year for senior grade membership and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

• Springfield (Mass.)—Milton Kalisher and G. S. McCloy, Westinghouse Electric and Manufacturing Company, presented "Modern Magic", an exhibit, as coffee speakers at the October 9 meeting. Louis Lingler, Sheffield Corporation, was principal speaker. He discussed precise gaging operations in industry.

• Schenectady—I. Kessler and T. A. McMullen, Radio Corporation of America, shared the subject, "Tool Design for Production" at the October 12 meeting.

• Rochester—The October 12 meeting was addressed by G. H. Stimson, Greenfield Tap & Die Corporation. His subject was "Screw Threads and Gaging of Same".

• Portland (Ore.)—Micromatic Hone's John Kinsey was speaker at the October 16 meeting. He discussed the subject, "Micromatic Honing".

• Philadelphia—H. Gotberg, Colonial Broach Company, addressed members on "Modern Broaching" at their October 19 meeting. Coffee speaker was Philip H. Ward, Jr., who spoke on stamp collecting.

• Peoria—Peoria Chapter members heard Dr. Harry B. Osborne, Jr., Ohio Crankshaft Company, discuss "Induction Heating" at their October 3 meeting.

• Newark—Northern New Jersey Chapter heard two plastics authorities discuss "Plastics and Plastic Designs" at their October 12 meeting. Speakers were President George K. Scribner, Boonton Molding Company, and Islyn Thomas, Brooklyn Polytechnic Institute.



Introducing new officers of New Haven Chapter 41: (standing, left to right) Henry C. Griggs, F. J. Dawless, Past Chairman and Past Regional Director, and George F. Westerman; (Seated, left to right) Floyd W. Braynard, L. Heres DeWyk, M. J. Radecki, Ray E. Gifford, A. V. Pollard, Treasurer, J. F. Sargent, First Vice Chairman, Frank A. Shute, Secretary, C. A. Chipman, R. M. Strickland and J. S. Diefenbach. Missing from the photo is M. J. Weldon, Chairman, and John Alton, who took the picture.

• Niagara District—H. Chambers, Atlas Steels Ltd., was principal speaker at the October 20 session. He chose as his topic, "Selection of Tool Steels".

• New York—Greater New York Chapter studied powder metallurgy with G. E. Platzer, Chrysler Corporation, who discussed "Making Machine Parts from Metal Powder". The meeting was held October 2. A movie filmed during invasion of France was shown.

• Los Angeles—W. T. McCargo, Carbide Company, was principal speaker at the October 12 meeting. His subject was "Abrasives". A film supplemented the discussion.

• Springfield (Vt.)—Twin States Chapter heard H. T. Johnson, General Motors Corporation, who discussed efficiency and maintenance in industry, at their October 11 meeting.

• Hamilton—H. J. Staff, Crucible

Steel Company of America, presented 130 members with a discussion of "Proper and Improper Design of Tools and Dies" at their October 10 meeting.

• Potomac—William S. Jack, President, Jack & Heintz, addressed the Chapter on "Humanism In Industry" at its November 2 meeting.

• Indianapolis—"History and Development of Torpedoes" was subject of a talk by E. M. Seifert, Naval Torpedo Station, at the November 2 meeting.

• Binghamton—Members met October 4 to hear Arthur A. Cambria, LaPointe Machine Tool Company, speak on "Broaching". Movies followed.

• Boston—P. A. Miller, Tubular Rive and Stud Company, was guest speaker at the October 12 meeting. His topic was "Powder Metallurgy".

• New Haven—New Haven Chapter opened its season with a meeting October 12 at which C. M. Ripley, General Electric Company, spoke on "Power for War".

• Bridgeport—Lou Lingler, Sheffield Corporation, spoke on "Dimensional Control and Gaging Practice" at the October 4 meeting.

• York—Central Pennsylvania Chapter met October 10. Speaker was J. P. Holloway, Armstrong Cork Company, on the subject "Need of Tool Engineers".

• Cincinnati—C. K. Worthen, Norton Company, discussed "Manufacture and Application of Diamond Wheels" at the October 10 meeting.

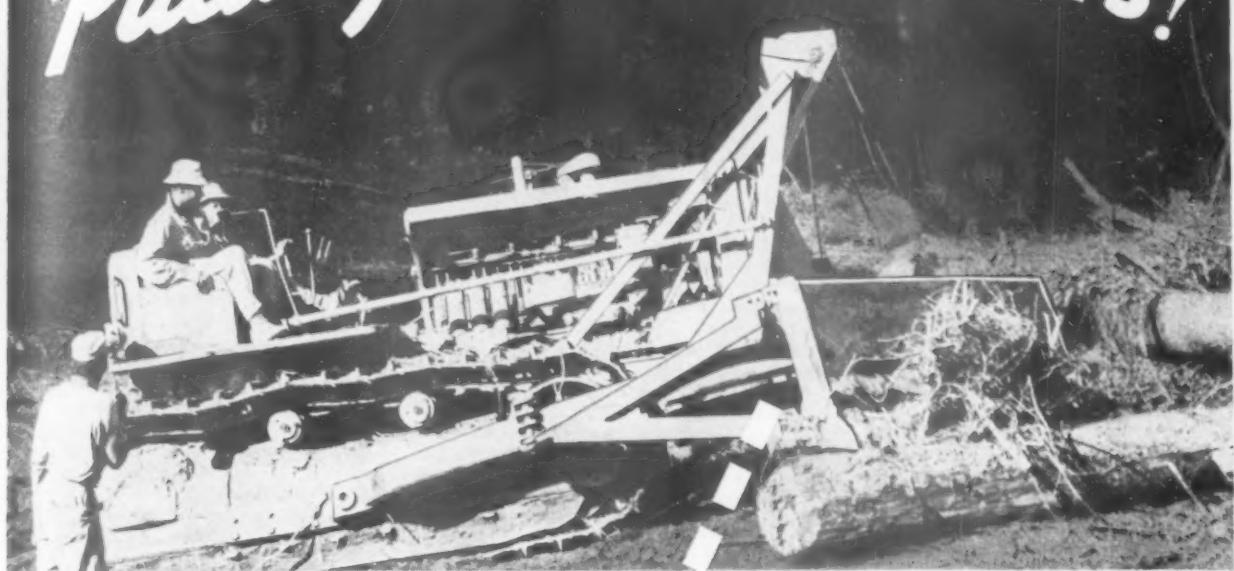
• Milwaukee—"Advantages of Metal Stampings in Volume Production" was shared by Ray Buettner, William Sie-

(Continued on page 202)



Lieut. Henry A. Parkins, USNR, Engineering Officer, Naval Ordnance Laboratory, Silver Springs, Md., is shown as he addressed Potomac Chapter at their September meeting. His subject was, "Plastics—Uses and Fabricating Methods".

Putting "Hep" IN THE "CATS!"



NEWSTWEEK of August 28 reports of Lieut.-General George S. Patton, Jr., as follows: "If he had to choose between tanks and bulldozers for an invasion he would choose road-building equipment every time." More than a construction machine, the bulldozer has been a powerful factor in winning many battles.

To quickly, efficiently fit axle shafts and bearing cups into bulldozer transmission cases, American engineers designed a special horizontal assembly press. A conveyor line brings the cases to the machine and removes them after operations are completed. The part is

stopped, locked in position, pressed, and released by this hydraulically operated, push button controlled machine.

This is another example of how the American Broach and Machine Company help leading manufacturers increase output of vital war materials. When the war job is done, American's complete service of machines, tools, and engineering will be available to speed manufacture of civilian goods. Let American engineers show you how broaching or special machinery can solve your production problems. Write today for details.



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DIVISION OF
SUNDSTRAND MACHINE TOOL CO.
SUNDSTRAND INDUSTRIES INC.

vert and Lester Birbaum, Milwaukee Stamping Company, at the October 12 chapter meeting. There were 175 at the technical session.

● **Schenectady**—The chapter held a non-technical meeting September 14 at which they viewed an exhibition of judo, ju jitsu and hand to hand combat. E. Charette entertained with magic.

● **Toledo**—William Jack, Jack & Heintz Company, spoke at the October 11 meeting of Toledo Chapter. Subject was "How Jahco Achieves Production".

● **Hartford**—Dr. Orlo L. Crissey, General Motors Corporation, was speaker at the October 2 meeting. He discussed "Reemployment, Rehabilitation and Training of Returned Veterans".

● **Rockford**—Chapter members were guests of the W. F. & John Barnes Company's Ordnance Division at a plant visitation.

● **Toronto**—Benjamin L. Wise, Federal Machine & Welder Company, discussed "Electronics in Resistance Welding" at the October 2 meeting.

● **Cleveland**—Cleveland Graphite Bronze Company was host to chapter members on a plant tour October 13.

● **Detroit**—Detroit Chapter held a joint session with the Society of Plastic Engineers October 19. The program was

presented by Celanese Celluloid Corporation. Speakers were William F. Cullom and David S. Hopping.

● **Fort Wayne**—Members heard W. R. Caple, Dow Chemical Company, on "Processing of Magnesium" at their October 11 session. Coffee speaker was A. E. Feighter, Lima Locomotive Works.

● **Williamsport**—Otto C. Winter, Acme Pattern & Machine Company, opened the winter season for Williamsport Chapter with an address on "Post-war Tool Engineering". Winter is National Chairman, Education and Training Committee, A. S. T. E. The meeting was September 11.

● **Erie**—First session of the year brought members together to hear William L. Kennicott, Kennametal, Inc., on the topic of high speed milling with cemented carbide. He illustrated with motion pictures. This meeting was September 5. The October 5 meeting featured the talk of G. Edward Pendray, Westinghouse Electric & Manufacturing Company. Pendray talked on "Rockets and Jet Propulsion".

● **Dayton**—Maj. Raymond Fanning, Public Relations Department, Air Service Command, was speaker at the September 11 meeting. He presented an informative discussion of problems of supplying a world-wide army. A score of maps illustrated the talk.

● **Grand Rapids**—Dan W. Kimball, Owen-Ames Kimball Company, discussed "Postwar Planning" at the September 11 meeting of Western Michigan Chapter.

● **San Diego**—Major H. R. Jordan, U. S. M. C., was guest speaker at the October 23 session. The technical session was addressed by John W. Kinsey Micromatic Hone Corporation, on the subject, "Hone Abrading Process in Modern Mass Production". Two sound films were also shown.

● **Pittsburgh**—Pittsburgh Chapter turned out 114 to hear a technical discussion, "Negative Rake Milling", by Charles O. Herb, Editor of Machinery.

● **Minneapolis**—Twin Cities Chapter met October 18 to see a film, "An Exact Duplicate", shown by Elton Miottel, George Gorton Machine Company.

● **Springfield (Ill.)**—Coffee Speaker Don Schweitzer, Allis-Chalmers Manufacturing Company, told members post-war production must be based on tools to produce lower cost commodities. F. O. Hoagland, Pratt & Whitney, talked on jig boring operations. The meeting was September 12.

● **Kansas City**—Webster Townley, Townley Metal & Hardware Co., traced labor-management relationships from ancient beginnings, in his address before members at the October 6 meeting
(Continued on page 204)

THE RIGHT WAY TO GRIND MILLING CUTTERS

SEND FOR THIS FREE INSTRUCTION BOOKLET

Just Off The Press

As experienced shopmen know, there is a right way and a wrong way to grind and true up milling cutters. As considerable misinformation exists on this vital subject, we felt the metal-working plants of the country could make good use of a booklet giving authoritative instruction. So, our engineers and designers — men who through two world wars have been making fine metal-cutting tools — got together and produced this booklet.

In addition to numerous clear illustrations, it contains engineers' diagrams wherever dimensions, clearance angles and close adjustments enter into the set-up. The booklet also contains a useful section on reblading inserted-blade milling cutters, with illustrations showing just how to remove and insert the blades without injury to the tool or loss of efficiency.

The booklet is free. Send for your copy now.



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MANUFACTURED ONLY BY THE OK TOOL COMPANY, SHELTON, CONN., U. S. A.

ACCURACY AND ECONOMY

} outstanding features
IN THE HIGH SPEED, AUTOMATIC PRODUCTION OF
FORMED METAL STAMPINGS
ON THE U. S. MULTI SLIDE MACHINE

THE layout drawing at the right shows one of the methods followed for producing a formed metal stamping on the U. S. Multi-Slide Machines. The part is produced from flat stock which is fed into the machine from coils and the parts are produced complete without secondary handling. This particular set-up shows the use of a rear auxiliary movement for shearing the part as shown in the layout. This rear auxiliary movement operates through the die.

Also indicated in the layout is the forming of the part on two levels; one of the many advantages of the U. S. Multi-Slide Machine. After the pre-forming operation in the upper level, the partially formed part is transferred to the lower level by means of a stripper mechanism where the final forming is accomplished.

This particular part was produced on the No. 33 U. S. Multi-Slide Machine, an illustration of which appears at the bottom of this page, at a speed of 125 complete parts per minute. The sequence of operations is at the right.

The forming of parts can be handled on one, two, or three levels. In this case two-level forming was used. The majority of parts, however, can be formed complete in one level.

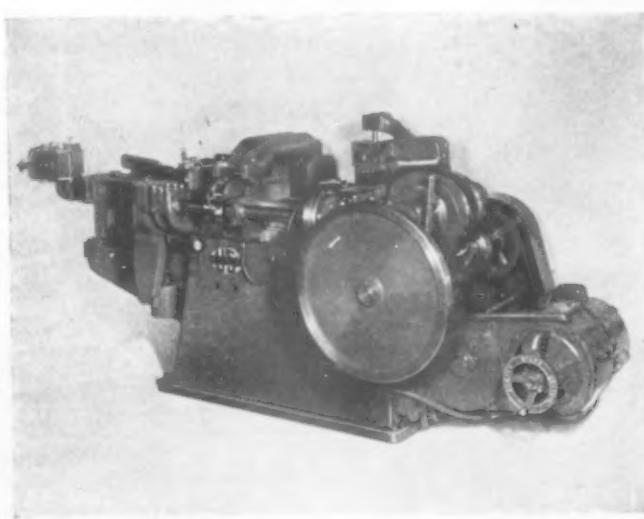
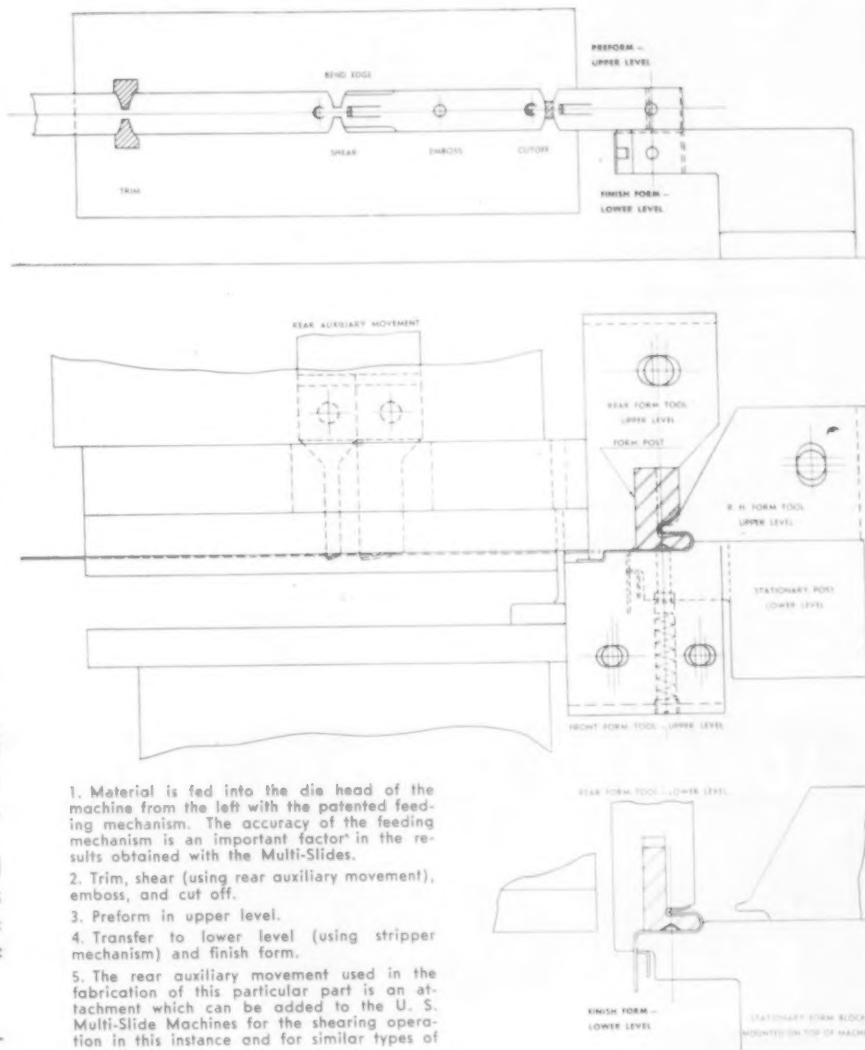
If your program involves the production of formed metal stampings, the U. S. Multi-Slide Machines should prove of interest to you. Bulletin No. 15 contains complete descriptions and specifications for the various sizes of Multi-Slides which we manufacture. Ask for your copy. Upon receipt of samples or part drawings we shall be glad to submit a quotation together with production estimates on equipment for your service.

U. S. TOOL COMPANY, Inc.

Ampere, (East Orange), New Jersey

Builders of the U. S. Multi Slides — U. S.
Multi Millers — U. S. Automatic Press
Room Equipment — U. S. Die Sets and
Accessories.

NOVEMBER, 1944



● **Tri-Cities** — A movie, "Industrial Molding of Rubber", was shown at the October 9 meeting. Commentator was P. H. Geil, B. F. Goodrich Company. Arthur X. Christensen gave the coffee speech, "Testimonial".

● **Portland (Me.)** — Members heard an interesting talk on military railroading by a representative of the Bangor and Aroostock Railroad, at their September 15 meeting. Adrian Potter, National ASTE secretary, was a chapter visitor.

● **Louisville** — Two military speakers, Colonel Theodore L. Preble and Major Lyman F. Strangle, both of Fort Knox, addressed the October 10 meeting. They discussed problems of military supply and maintenance.

● **Houston** — Following coffee speaker, John Sides, Hughes Tool Company, the time was turned over to A. H. d'Arcambal, who talked on "Design of Cutting Tools and Their Metallurgical Aspects". d'Arcambal is metallurgist for Pratt & Whitney. The meeting was September 19.

● **San Francisco** — Captain Ivor De Kirby was speaker at the September 12 meeting. He chose as his topic, "Logistics in World War II". He was introduced by Major W. A. Doble Jr. Present were 100.

● **Fond du Lac** — Members heard Elton Miottel, George Gorton Machine Com-

RICHMOND CHAPTER ADDED TO LIST OF A.S.T.E. GROUPS

Richmond, Indiana, became the 66th chapter to affiliate with the A. S. T. E. at ceremonies conducted September 27 under direction of Don B. Showalter, Chairman. Other officers include, Roland E. Lockridge, Leslie W. Court, William E. Small and Earl S. Kinnear.

Mayor John Britton welcomed the group to the city. W. B. Peirce, National Third Vice President, presented the charter.

Attendance was 138. The chapter meets the second Tuesday monthly.

pany, in a talk entitled, "An Exact Duplicate". Re-production of difficult shapes was shown in a movie with the same name. The session was held October 13.

● **Elmira** — Otto C. Tabbert, Harnischfeger Corporation, discussed "P & H Production Welding Control System" at the October 2 session. A movie, "New Horizons in Welding", completed the program. Attendance was 127.

● **York** — Dean W. Seitz, York Corporation, discussed uses of "Refrigeration in the War Effort" at the September 12 meeting. Slides were used to augment the talk.

● **Buffalo-Niagara** — Speaker at the September 21 meeting was J. P. Gill, Vanadium-Alloy Steel Company, who spoke on "Modern High Speed Steels".

Coffee speaker was Otto Winter, who talked on the Syracuse convention plans.

● **St. Louis** — "Centerless Grinding", a talk by Linc Melhope, Cincinnati Milling & Grinders, Inc., was feature of the October 5 meeting. On November 2, the meeting was themed around "Electronic Controls for Machine Tools". Actual demonstrations of electronic equipment were available.

● **Wichita** — Jack Kice, Boeing Airplane Company, spoke on "Refrigeration in Industry" at the October 10 meeting of Wichita Chapter. Attendance was 53.

● **South Bend** — Elton Miottel, George Gorton Machine Company, was guest speaker at the October 10 meeting. He spoke on "An Exact Duplicate". A movie with the same title was also shown to illustrate the talk.

● **Columbus** — Columbus Chapter set aside technical problems to hear E. C. (Irish) Kreiger, leading sports referee, discuss football rules. He showed movie shorts.

● **Worcester** — Harold T. Johnson, General Motors Corporation, was speaker at the October 13 meeting, attended by 350. Johnson spoke on "Usage and Maintenance of Machine Tools". The talk was illustrated by movies and slides.

(Concluded on page 206)

LOMBARD SURFACE AND ANGLE PLATES

VITAL FOR SUCCESSFUL INSPECTION

Rigid control of production methods assures unequaled precision in these Lombard inspection plates. Long life accuracy and resistance to machining stress comes from careful heat treating of the close-grain, semi-steel type iron and from the scientifically designed ribbing. Careful scraping assures finished accuracy.

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MACHINE FINISH — an Excellent Commercial Finish

GROUND FINISH — for Closer Tolerances

HAND SCRAPED FINISH — Finest Finish — for Extreme Accuracy

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HARDENED AND GROUND V BLOCKS

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Lombard Precision Equipment



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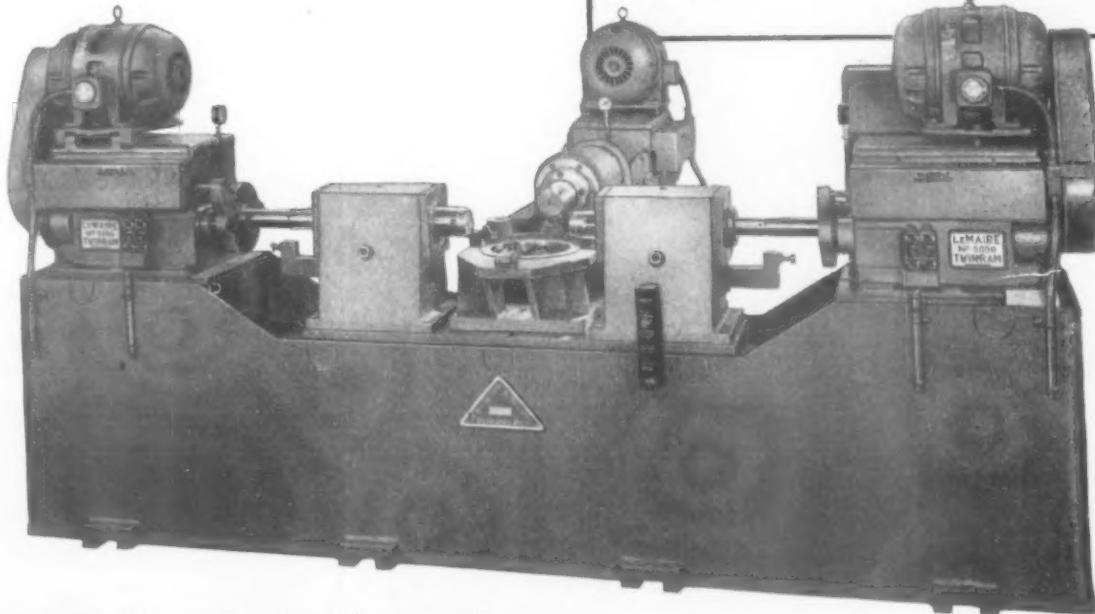
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ANOTHER APPLICATION of LE MAIRE TWIN RAMS

34 Axle Mountings per hour

rough bored and finish faced in one setup . . .

on this new machine designed
and built by LeMaire



Same capacity maintained in second run, which finish bores the parts to .001 tolerance

The truck axle mounting, or carrier, is located on a fixture in the middle of the machine. Two heavy-duty spindle quill assemblies rapid advance from opposite sides to rough bore and finish face a 4-inch hole on one side and a 4.8-inch on the other, while a two-spindle slide type boring head in the rear bores through two 4.9-inch holes. (Actual sizes and locations of holes are indicated in large photo.)

Three No. 5000 Twin Ram Hydraulic Units are employed to rotate and feed the tools—demonstrating further the unusual versatility of these powerful units. The variety of applications is almost limitless—which adds great economy to their high efficiency. The units can be interchanged from one base to another.

Perhaps your production can be simplified through the use of one or more of these units. It costs nothing to discuss these possibilities with our engineers.

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LEMAIRE TOOL & MFG. CO.

NOVEMBER, 1944

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FOR BORING, DRILLING, REAMING,
TAPPING, ETC.—TWIN RAM HYDRAULIC
UNITS—MATCH-IT GEAR CHUCKS
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how to buy... a cutting fluid



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For instance:

Lower viscosity does not necessarily mean more effectiveness at the work area.

Dark oils are often cleaner than light-colored, clear-looking oils.

More total sulphur does not always mean better cutting quality.

Straight oils are often better refrigerants at the point of contact than soluble products.

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The wise buyer measures cutting fluids by how they perform on the machine. To find the best performing oil for his needs, he looks to experience.

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of the New Stuart 60 page handbook: "Cutting Fluids For Better Machining." It is full of data—information that you will find a helpful guide to the most efficient use of cutting fluids. It is free to executives and engineers.

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— A. S. T. E. DOINGS —

• **Montreal**—George S. Sanborn, Fellow Gear Shaper Company met October 11 with Montreal members to discuss "Good Gears and Bad Gears". A movie giving a preview of television progress completed the evening.

• **Dayton**—Members and guests, 160 strong, toured Aeroproducts Division, General Motors Corporation at Vandalia, October 9. Brief talks were given by supervisory employees and visitors saw several films, and viewed tests.

NATIONAL A.S.T.E. OBTAINS PENOBSCOT OFFICE SPACE

The National Headquarters of the American Society of Tool Engineers were scheduled to be moved from present quarters to 1666 Penobscot Building, Detroit 26, according to announcement of Adrian L. Potter, executive secretary. Charles J. Hasse is Office Manager.

* * *

Coming Meetings

Minneapolis—Twin Cities Chapter November 15, Covered Wagon Cafe.

Newark—Northern New Jersey Chapter, November 14, Hotel Robert Treat.

Montreal—Windsor Hotel. Speaker will be George Gorton III, George Gorton Machine Company.

Chicago—December 4. Speaker will be Julian S. Carvalho, Machinery Manufacturing Company.

Williamsport—November 13, Odd Fellows Temple. Speaker will be Mr. Stagg, Crucible Steel Company of America.

Atlanta—November 8, Henry Grady Hotel. Speaker will be Arthur J. Schwartz, Bell Aircraft Corporation.

Wichita—November 10, Droll's English Grill. Speaker will be G. H. Sanborn, Fellows Gear Shaper Company.

Schenectady—November 9, Elks Club. Speaker will be Mr. Rossman, Curtiss-Wright Corporation.

Cleveland—November 10, Hollenden Hotel. Speaker will be H. J. Stagg, Crucible Steel Company of America.

Elmira—November 6, Mark Twain Hotel. Dr. Charles Copeland Smith, National Association of Manufacturers, will speak.

Fort Wayne—November 8, Chamber of Commerce Building. B. T. Anderson, Sundstrand Machine Tool Company, will speak.

Milwaukee—November 9, Astor Hotel. Arthur Peck, Milwaukee Die Casting Company, will be the speaker.

Toledo—November 8, Yacht club. Earl W. Daugherty, Whitman & Barnes Company will speak. THE END

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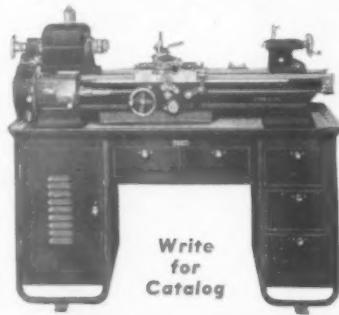


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BACK GEARED, SCREW CUTTING SHELDON PRECISION LATHES

1" Collet Capacity 11 $\frac{1}{4}$ " Swing
The SHELDON 10" x 1" series Precision Lathes, combine the advanced features of extra collet capacity (1-inch), extra swing (11 $\frac{1}{4}$ inches), an efficient 4 speed, V-belt underneath drive, and a commodious steel cabinet base. The headstock, spindle and spindle bearings are larger and heavier than is standard for 10-inch lathes giving not only increased production capacity but also assuring permanency of this lathe's extreme accuracy. SHELDON 10" x 1" Lathes have full quick change gears, a worm feed apron with power cross feed and every other essential feature of a quality machine tool, still are surprisingly low in price.

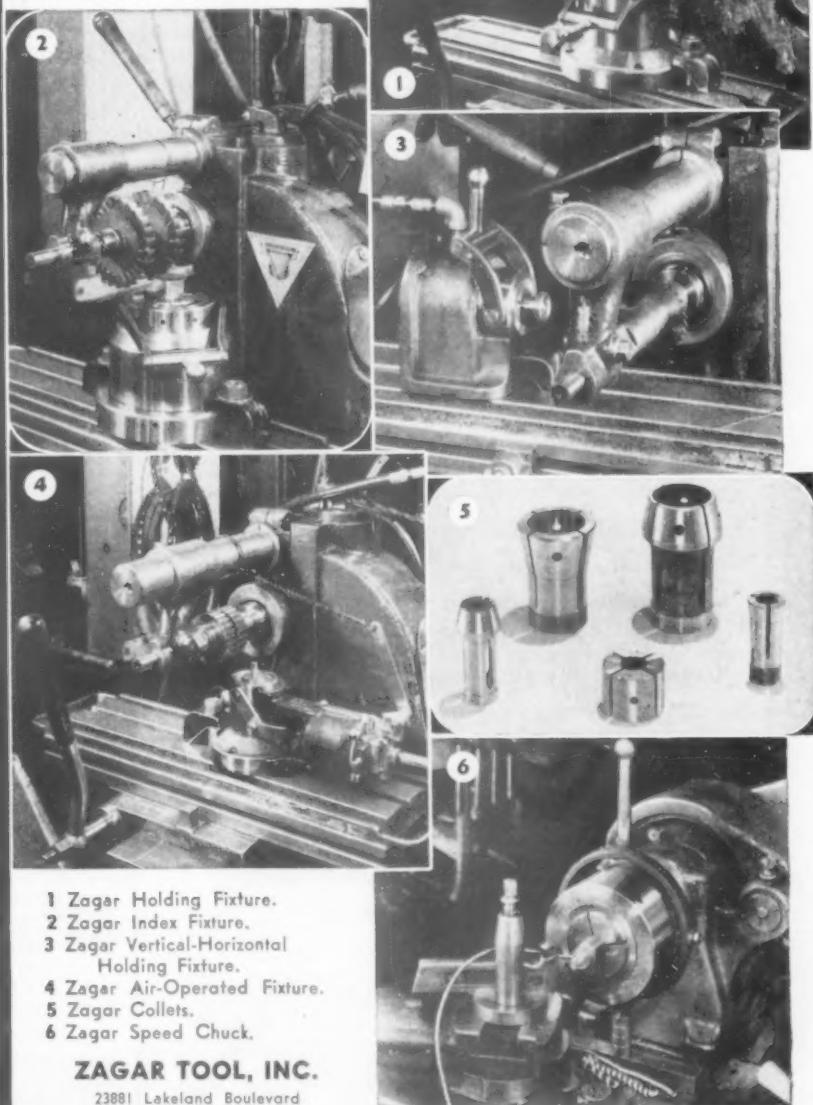
SHELDON MACHINE CO., INC.
4252 N. Knox Ave. Chicago 41, U.S.A.

NOVEMBER, 1944



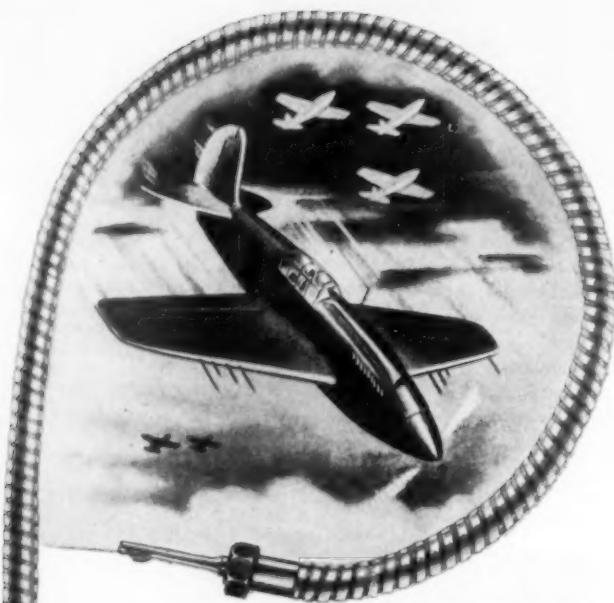
Each action picture below stands for a typical job on which Zagar Fixtures notably jumped production, besides maintaining close tolerances and accuracy generally — without special tooling.

• Zagar Fixtures, in 1" and 2" sizes and five types, are proven aids to both quantity and quality production, especially milling, drilling, tapping, slotting, grinding and similar operations. Simple design—easy to master, no upkeep. Precision-built, yet rugged; "last forever." No chip trouble. One trial convinces.



Get bulletin on any of these fixtures.

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INDEXING HOLDING FIXTURES



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IS THE SHORTEST WAY HOME"...**
Specify

Walker-Turner Flexible Shafting

In transmitting light power loads between two points, it is often possible to design a simpler, lighter, more compact product with Flexible Shafting than with gears.

You'll find, too, that it pays to specify Walker-Turner Flexible Shafting on jobs like these — for smoother power flow, more sensitive control, trouble-free operation. Into this product, we've packed all the "know-how" picked up in years of manufacturing our own flexible shaft machines . . . in years of working with other manufacturers on problems of power transmission and remote control. Let us know if we can put that experience to work for you!

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FLEXIBLE SHAFTING
FOR REMOTE CONTROL AND POWER TRANSMISSION

6-11



BOKUM SINGLE POINT CUTTING TOOLS

Style A—
for general boring

Style B—
for bottoming and facing

Style C—
for threading

... Bored and bottomed the large blind hole—then faced the stepped surfaces.

ALL WITH ONE BOKUM BOTTOMING AND FACING TOOL (STYLE B)

Helical back off insures constant clearance and extremely long life of tool, since sharpening is done by grinding face only. Why use two tools when the job can be done with one?

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Checks precision bores
to fractions of .0001"

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Comparator



Sizes: 1/4" to
7" dia. and
larger



**MACHINE
OPERATOR**



**BENCH
INSPECTOR**



**SUPERVISING
INSPECTOR**

Comtorplug's unique simplicity permits "Matched Gaging" on production of precision bores. Operators, bench inspectors and supervising inspectors all use the same precision gage, speeding and improving production and decreasing rejects. To fractions of .0001" Comtorplug shows size, out-of-round, front or back taper, bell mouth, etc. self-aligning and centering. Not a passing reading. This equipment is now readily available.

Request Bulletin 29

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ONE



TWO



THREE

Using the MAGNA SINE Table of Constants supplied with each MAGNA SINE select the gage block that is equal to the sine of the desired angle. The sine bar method is the only truly accurate method of determining angles. This fact plus the extreme accuracy with which the MAGNA SINE is built means set-ups that are true to the highest degree of precision.

Place the gage block between the roller bar and the base plate, tightening the holding screw at the pivot for increased rigidity. The MAGNA SINE is now completely set. Nothing can move, yet there is no pressure to distort the set-up and cause inaccuracies. Setting up a compound angle is no more difficult than setting up a single angle. It simply requires one more gage block and a compound angle MAGNA SINE.

Now place the work on the MAGNA SINE and throw the switch. The work is held securely and is ready to grind. This simple procedure has taken but a few seconds at the most as contrasted with an hour or more often required for making angular set-ups using sine bars, angles and conventional methods. Every grinder doing an average amount of angular grinding work should be equipped with its own MAGNA SINE for better work at lower cost.

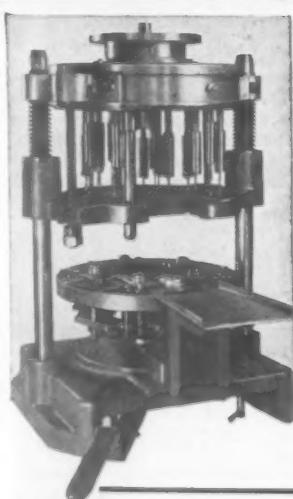
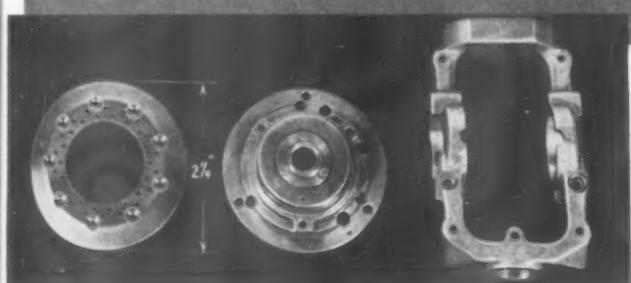


Robbins ENGINEERING COMPANY

318 MIDLAND AVE.

DETROIT 8, MICHIGAN

IT PAYS TO MULTIPLE DRILL OR TAP
SMALL PARTS . . . CONSULT *Ettco-Emrick*



Parts like those illustrated, require the indexing method. At left is the complete head with bushing plate and indexing fixture for handling these parts. The center part, for example, using 16 spindles, is drilled and countersunk at each stroke of the drill press — time 30 seconds counting loading and unloading, as compared with the single spindle time of 12 minutes.

How to handle small parts for multiple drilling or tapping is a specialized engineering proposition. Perfected through 25 years specialization in this field, the Ettco-Emrick System of Multiple Spindle Heads offers a dozen different work handling methods which assure fastest production on a wide variety of small parts sizes, shapes and hole combinations. Cost is low because Heads are made of standard stock parts and can be used on any standard drill press.

Before you decide on how to drill or tap any small part, it will pay you to send a drawing or sample to Ettco-Emrick for recommendations and quotation on the right Multiple Head for the job.

ETTCO TOOL CO.

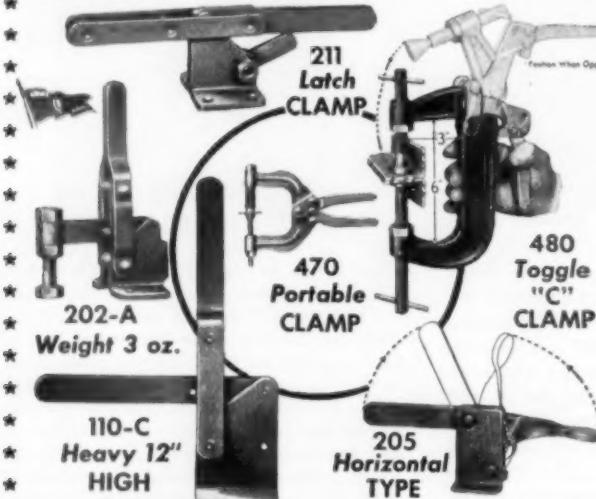
586 Johnson Ave., Brooklyn 6, N. Y.

Detroit 1 • Chicago 6



Building JIGS or FIXTURES?

Then you'll need some of those quick acting, positive holding, De-Sta-Co Toggle Clamps . . . Bulletin No. 43 will help you select the clamps best suited to your job. Send for it.



DETROIT STAMPING CO.
Established Over 25 Years
356 Midland Ave. • Detroit 3, Mich.



**GRIND Difficult Contours
and Profiles FASTER...BETTER**

BOYAR-SCHULTZ Profile Grinder No. 1 replaces slow hand work in fitting dies and punches, grinding die clearances and odd shapes encountered in cams and templates.

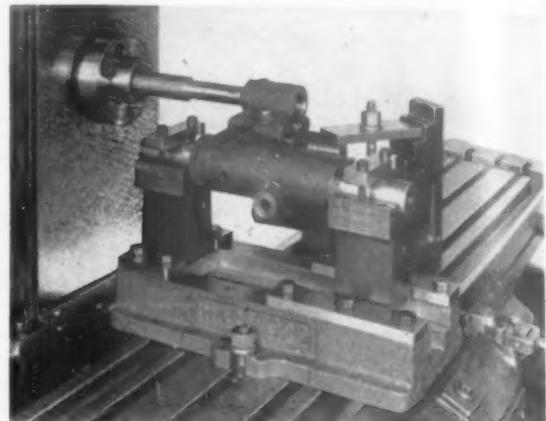
High speed of 20,000 assures efficient grinding, even with $\frac{1}{8}$ " diameter wheels.

New serrated top table permits smooth movement of work and grinding to closer tolerances.

Write for Descriptive Circular

BOYAR-SCHULTZ CORPORATION
2116 Walnut St. CHICAGO 12, ILLINOIS

THE HARTFORD V-BLOCK FIXTURE



Simplifies Set-Ups • Saves Time • Insures Better Work

BORING: Illustration shows a typical set-up of an irregular casting, being accurately bored on a milling machine. Rapidity and simplicity of the set-up are apparent. The first hole is bored or drilled in the casting . . . other holes are thereafter bored parallel and in accurate relationship to the arbor. * Write for literature describing how this V-block speeds up tough set-ups.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

Darwin

NEOR

The Original Oil Hardening,
Non-Deforming High
Carbon-High Chrome Steel

NEOR is recognized as one of the finest high-carbon, high-chromium steels. For quantity production, NEOR is unsurpassed for dies. Retains a keen edge much longer than carbon or high speed steels. NEOR hardening penetrates to the center of the tool and is non-deforming.

Owing to its remarkable resistance to abrasion, NEOR is ideal for gages.

Furnished in Billets, Bar Stock and Drill Rod.

Bulletin on Request

DARWIN & MILNER Inc.

highest grade tool steels

1260 W. FOURTH ST. CLEVELAND 13, OHIO

**THE
IMPROVED
NIELSEN
LIVE
CENTERS**

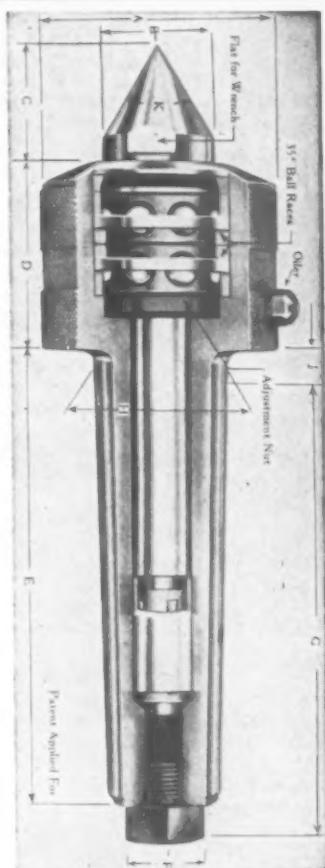
Load capacity
200 to 40,000 lbs.
at 100 rpm.

Have adjustment
to take up wear
and
preload bearings

Standard Morse
Taper No. 2 to 6
in stock

★
**WRITE FOR
CATALOG**

NIELSEN
INCORPORATED
LAWTON • MICH.



**GAMMONS
OF
Manchester**



PRODUCTION TOOLS

ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.



Prompt Delivery

**Precision Ground
THREAD PLUG
and
RING GAUGES**
PROVE YOUR PRODUCT!

With ALLEN GAUGES of all types—pro-
file — length — flat — flush pin — snap
— limit.

Also prompt delivery on special gauges
for Ordnance Departments, plain plug &
ring gauges, special jigs, fixtures and ma-
chinery. Send us prints for quotations and
quick service on production thread grind-
ing, small lot production machining and
various other small gauges and products.
Write —



ALLEN GAUGE & TOOL CO.
421 N. Braddock Avenue, Dept. E.T.
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NOVEMBER, 1944

REG. U.S.
PAT. OFF.
**HY-PRO
TAPS**

Include In Your

**POST WAR
PLANS**



Cut Thread
•
Commercial
and
Precision
Ground
Threads
•
Special
Taps

*A Tap
For Every
Purpose*



If threaded pieces are included in
your plans for reconversion to
peacetime production, specify
HY-PRO Taps as standard tap-
ping practice.

To prove the consistently high
production and low cost these
precise, rugged taps will effect,
use them for present tapping
needs—you'll produce more ac-
curate threads per tap to closer
limits. This extremely accurate
tapping assures tighter, stronger,
vibration-defying fastening of as-
sembled parts.

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A. BUY MORE BONDS

• THE PASSING PARADE •

T. M. REG. BY THE BRAMSON PUBLISHING COMPANY

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

Heat Treater—Starr Heat Treating Company reports addition of John A. Fraser to its staff. Rowland H. Starr, President, said Fraser will be metallurgist and will supervise quality control and technical processes, and will be available to industry on a consulting basis. Fraser served two years as plant manager for Die Typing Corporation. For 27 years he was in the laboratory and heat treating departments for Ford Motor Company.

Factory Manager—Harry Hayden, with Cleveland Pressed Steel Company since 1914, has been promoted to General Factory Manager, according to James F. Strnad, President of Lempco Products, Inc., recent purchasers of Cleveland Pressed Steel Company. George Breck will continue as Vice President and General Manager.

Postwar Planning—Moving to integrate manufacturing facilities for postwar business, Reliance Electric & Engineering Company has added responsibilities for three production heads, according to announcement of S. B. Taylor, Manufacturing Vice President. Reliance Marine Plant and Plant No. 2 will become a self contained Marine Division, headed up by Karl H. Meyer,

Manager. He has been Marine Plant Superintendent and Works Engineer at the Main plant. W. H. Haber will serve this new division as Production Manager. The Main Plant will be called Ivanhoe Division and will be managed by Robert W. Cornell.



L. C. Stork



David Sussin

troller, will be advanced to Assistant to the President. David Sussin, Chief Engineer, will be Chief of Research.

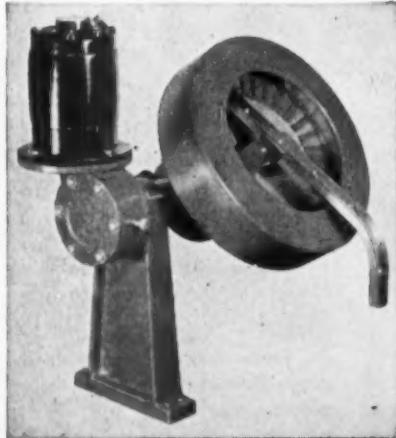
Metals Engineer—A. F. Sprankle has been named Metallurgical Engineer in Timken Steel and Tube Division, Timken Roller Bearing Company. Sprankle is a former Manager of the Alloy Bureau of Carnegie-Illinois Steel Corporation. He is a graduate of Ohio State.

Directs Manufacture—David B. Peckham has been appointed Comptroller of Manufacture for Western Electric Company to succeed John M. Stahr, deceased. Clifford W. Smith succeeds Peckham as Comptroller of Sales.

Engineer Consultant—Harry M. Dunn has been named Engineering Consultant for the Eclipse Counterbore Company in their Texas territory. He will also direct a sales and service organization.

Company Executive—Ellis L. Spray has been elected Vice President and General Manager, Westinghouse Electric Elevator Company, to succeed (Continued on page 214)

HOPPERS and SCREWDRIVERS



FASTEST FEEDING HOPPER EVER DESIGNED!

ADAPTABLE TO ANY MACHINE!

NO JAMMING OR LOCKING!

HOPPER FEEDS: Bullet Cores, Rings, Pins, Rivets, Nuts, Screws, Discs, and Special Parts.

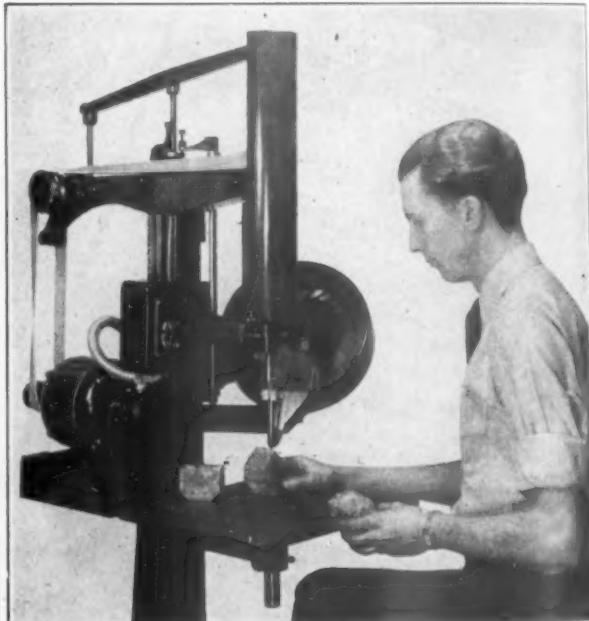
DRIVE SCREWS
the MODERN WAY

REDUCE COSTS
INCREASE
PRODUCTION

THREE MODELS

No. 2 to $\frac{3}{8}$ Screws

Send Samples
For Production
Estimates



DETROIT POWER SCREWDRIVER CO.

2805 W. FORT STREET

DETROIT 16, MICHIGAN

Cutting oil News letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

NOVEMBER, 1944



Operators vote for Stanicut 107 BC

At the start of a bomb fuse contract, an Illinois plant used a paraffin oil and base oil mix on the automatic machines making the fuses. Other oils were tested from time to time. The last one was Stanicut 107 BC—it's the one now used. First, because operators found the work was cooler—and easier to handle—and the oil was light in color. Secondly, management found it gave better finish and tool life and eliminated a mixing job—another four-way improvement from one Standard Cutting Oil Man's suggestion.

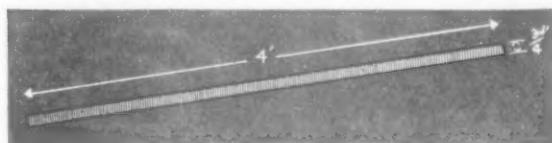
Cures "liver" trouble on forging operation

The lubricant used on forging dies in an Indiana plant was apparently satisfactory except for a "liver-like" sludge which formed when the lubricant separated. In an attempt to cure this trouble, Stanolind Forge Die Lubricant was tried. Much to the surprise of the plant men they found that not only the sludge trouble was ended but the new lubricant clung to the die better, and lubricant consumption was cut in half. Mention any problem, large or small, involving cutting oil or stamping compounds to a Standard Cutting Oil Specialist. You may turn his suggestions into a real saving.

Gasoline Powers the Attack... Don't Waste a Drop!

HD Soluble Oils—Stanicool— stops tool burning

An Illinois plant wanted to use soluble oils in a turret lathe operation on 4150 stock with high speed tools. But even with a heavy mix of 3 to 1 with conventional soluble oils, tools overheated and rejects were frequent because of poor finish and incorrect size. With no change in speed or feeds, Stanicool HD—a heavy-duty soluble oil—was tried. Even with a 5 to 1 mix, tools ran cool and rejects were almost unknown. Incidentally, soluble oil consumption was cut 50%.



Long threading job speeded up with Stanicut 309 BCS

The job of threading four feet of $\frac{3}{4}$ inch round, hot-rolled, 4130 bar stock was trying the patience of tool men in a Detroit plant. Chasers got hot and loaded so soon that it was almost impossible to get a satisfactory full length thread. Seven pieces for each grinding of the chaser was average production. Without any other change, Stanicut 309 BCS—a highly sulphurized, chlorinated cutting oil developed for heavy cutting jobs—was put on the operation. Overheating and loading of the chasers were completely eliminated. Production jumped to 24 pieces per grind.

See a Standard Cutting Oil Specialist. One of these Engineers can help you find the answer to your difficult metal working problems. Call the nearest Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago 80, Illinois, for his help. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION

STANDARD OIL COMPANY (INDIANA)

**STANDARD
SERVICE**

★ LUBRICATION ENGINEERING

PASSING PARADE

Frank C. Reed, retired. Announcement was by George H. Bucher, President, Westinghouse Electric and Manufacturing Company and of the subsidiary elevator company.

Shop Superintendent—R. A. Hartman, former master mechanic for Crosley Corporation, were recently named Machine Shop Superintendent for Kropp Forge Company and Kropp Forge Aviation Company.

Field Engineering—Paul A. Herr, formerly a partner in the Alfred Stauffer Machine Shops, and Harris H. Robbins, St. Paul Hydraulic Hoist Company machinist, engineer and Factory Superintendent, have joined Philadelphia Branch of Kennametal, Inc., as Field Engineering Representatives.

Foreign Sales—Aimed at markets outside the U. S., the newly-created Foreign Division of Timken Roller Bearing Company will be directed by Howard C. Sauer. Division offices will be at Canton, Ohio.

Production Manager—Kobe, Inc., reports appointment of A. M. Smith as production manager.

Fisher Appointments—T. P. Archer, General Manager, Pontiac Fisher Body Division, General Motors, announces promotion of George C. Patterson to General Manufacturing Manager and John J. Cronin to General Industrial Relations Director.

Special Planning—Lincoln Electric Company has transferred W. R. Persons from Pittsburgh District Manager to the Cleveland factory to a special war planning assignment. J. S. Roscoe, formerly of the Syracuse District, has been moved to the Pittsburgh District to fill the vacancy.



F. S. Mackey



F. C. Angle

Plant Managers—Three new works managers appointments are announced by Allis-Chalmers Manufacturing Company in the manufacturing division. The appointments were announced by James M. White, Vice President in Charge of Manufacturing, and include Hugo W. Liebert, General Works Manager, Tractor Plants; Fred S. Mackey, General Works Manager, General Machinery Plants, and Harry E. Ladwig, Works Manager of West Allis foundries and pattern shops. Also reported is appointment of Frank C. Angle as Manager of all Allis-Chalmers field sales offices of the General

Machinery Division. Angle is a graduate of Oregon State College and has been Pacific Region Manager. His elevation was reported by W. C. Johnson, Vice President.

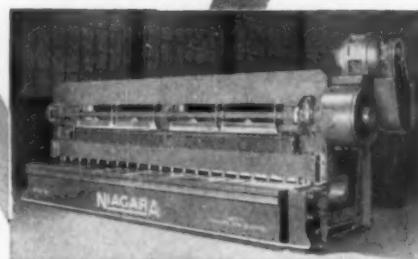
National Safety—George Currier, former Director Technical Features in the Department of Public Information and editor of "Safe Worker", has joined General Motors in the Field Relations division.

Chief Engineer—Triangle Manufacturing Company, Inc., reports appointment of Leon J. Cote as Chief Engineer. Cote was formerly associated with the Van Norman Company.

Two Appointments—Great Lakes Steel Corporation announces elevation of two officials. J. Emmett Fink, General Works Manager, becomes Vice President in Charge of Operations and Julius A. Klauss, Chief Engineer, will be Vice President in Charge of Engineering.

Three Promoted—Parker Rust Proof Company announces that Willard M. Cornelius has resigned as President to become Board Chairman. He reports that Van M. Darsey, Technical and Service Director, has been elected President and member of the board. Robert W. Englehart, Secretary, and A. C. LaRowe, Morenci Plant Manager, have become vice presidents.

(Continued on page 216)



NIAGARA

★

The SUPERFORTRESS—fastest of Bombers—is a dramatic example of America's ability to out-design, out-produce, and out-fight the enemy. Vital parts of the B-29 are being made better and faster with Niagara Presses and Shears. The complete range of sizes and capacities provides the most productive and economical machines for shearing, blanking and forming operations.

Write for Bulletins

*Buy
U. S. War Bonds*

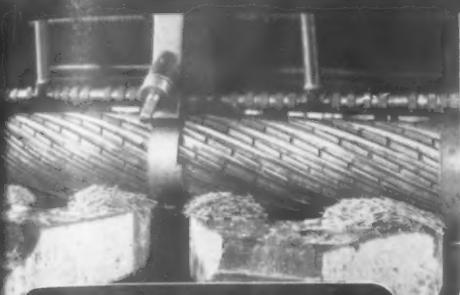
**NIAGARA MACHINE &
TOOL WORKS**

BUFFALO 11, NEW YORK
District Offices:
Cleveland, Detroit, New York

THE TOOL ENGINEER

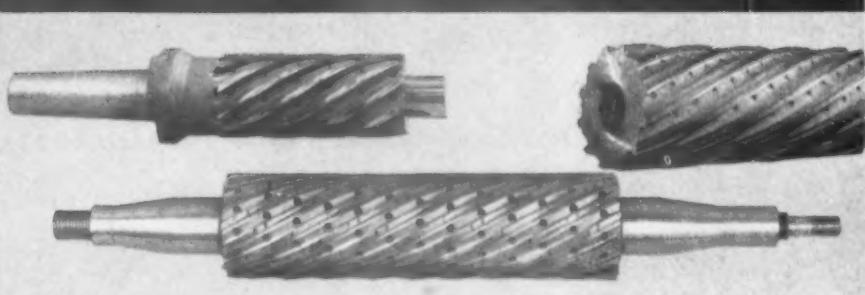
INGERSOLL

HELICAL CUTTERS

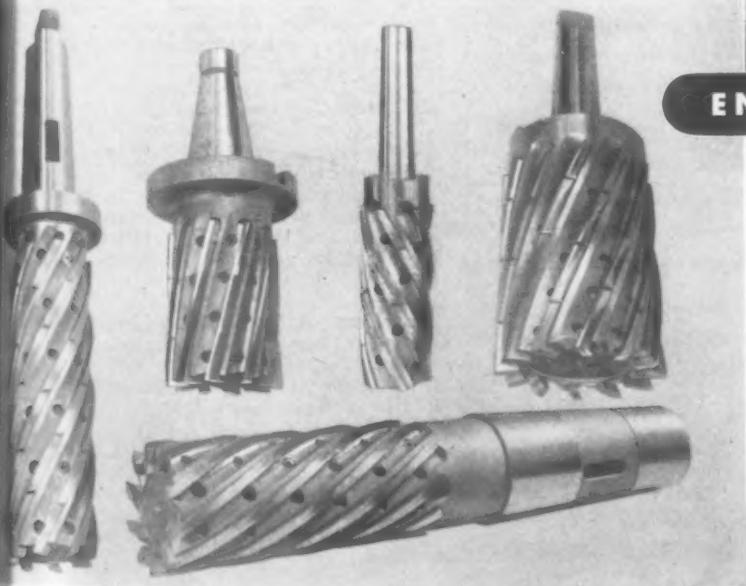


SLAB MILLING

Slab milling of wide surfaces is best performed with Ingersoll inserted helical blade cutters. These slab mills are used on the arbors of knee type machines as well as on large heavy duty Ingersoll slabbing machines as illustrated. These inserted blade slab mills are replacing many solid high speed steel types due to the economy of using renewable blades.



END MILLING



Ingersoll helical end mills are an efficient and renewable inserted blade cutter for milling wide surfaces on the periphery while end milling. Cutter furnished with slow positive helix angle for cutting on both face and periphery. When milling on periphery only, a high reversed helix angle is preferred to direct thrust back against machine spindle. Replacement blade costs are low.

Send for Engineering Specification Sheets describing complete line of Ingersoll standard inserted blade milling cutters.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS



★ HOW MANY PIECES BEFORE REDRESSING?

The Profilometer Gives the Answer!

It is possible, through use of the Profilometer, to schedule a dressing of the wheel following the production of a specified number of parts in any individual grinding setup.

In production grinding of parts, much depends on the proper dressing of the wheel:

- correct surface finish
- maintenance of accurate dimensions
- cutting down grinding time per part
- steady production on final finishing operations.



Because of the many variables in every grinding setup — condition of machine, material, grain and grade of wheel, etc. — it is difficult to determine exactly how many pieces can be ground for each dressing of the wheel — difficult, that is, without the Profilometer.



A definite solution to this problem is provided by taking Profilometer readings of parts as they come from the grinder. As the wheel wears, the changes in its performance are reflected in the Profilometer readings.

Use of the Profilometer for this purpose has shown that in any particular setup, the number of parts produced per dressing of the wheel remains practically constant.

Profilometer Has Wide Range of Uses . . .

The brief description above outlines but one of the many ways in which manhours, materials, and money may be saved through use of the Profilometer in measuring average surface roughness.

For more information on surface roughness and the Profilometer equipment for measuring it, write for the booklet *Practical Surface-Roughness Measurement*, mentioning this magazine.

PHYSICISTS RESEARCH COMPANY

343 SOUTH MAIN STREET

ANN ARBOR, MICHIGAN

—PASSED PARADE—

Sales Executive—Packard Motor Car Company announces appointment of Elliott Taylor as Assistant General Sales Manager. This follows appointment of C. E. Briggs to a similar post. Both appointments are part of a planned program of postwar sales, according to L. W. Slack, General Sales Manager. Taylor was an O. P. A. director and Briggs an eastern regional manager.

Officers Elected—William D. Little has been elected Hoskins Manufacturing Company President. Others elected include Austin G. Melcher, Vice President, and Arthur B. Tilton, Director.

District Manager—Henry Thomas Platz, for 20 years associated with the Briggs Manufacturing Company, has been appointed District Manager for the Sciaky Brothers. Platz resigned from Briggs in 1943 to work as a Consulting Engineer.



H. T. Platz



V. H. Ericson

Vice President—Johnson-deVou, Inc., announces appointment of Victor H. Ericson as Vice President. The newly-organized corporation will handle abrasive products. Firm executives were former associates in the Norton Company. Ericson was with Norton 21 years, the last 15 in sales engineering making engineering surveys.

Steel Representative—M. W. Cole has been named Assistant General Manager of Western Sales for Bethlehem Steel Company. Until September he was Chief of the Plate and Shape Division, W. P. B.

Company Officer—Clifford E. Sorenson becomes a vice president of F. L. Jacobs Company, according to announcement of Rex C. Jacobs, President. Sorenson was formerly with Continental Die Casting Company as President and remained as chief executive after Jacobs Company bought the firm out.

Vanadium Appointment—John B. Girdler has been appointed Sales Manager, Eastern District, Vanadium Corporation of America. He will be located in New York City.

Secretary-Treasurer—Clarence L. Riegel has been selected as Secretary and Assistant Treasurer of Luscombe Airplane Corporation, according to A. C. Hastings, Jr., President. Riegel is a former General Electric Assistant District Auditor and was President and Executive Manager of New York Credit Men's Association.

(Continued on page 218)

SUPERSET Phonopoints



**IN ALL STANDARD
AND SPECIAL ANGLES**

Superset phonopoints are shipped in special packages of 50 or 100. Smaller quantities are packed with equal care.

NEW ENGLAND Superset phonopoints are set to stay. The selected diamonds are so well anchored in the shanks that they will stand more than average abuse on trueing jobs for which they are designed.

New England Superset phonopoints are set concentric with the shank—the tip is always on dead center—they are lapped to any desired angle—then checked on the latest precision inspection equipment.

The illustration shows the care that is used in packing Superset phonopoints. This unusual package prevents damage, allows the foreman to keep track of stock, and the phonopoints are easily picked out and dispensed to the grinder operators.

Consult New England for details and prices.



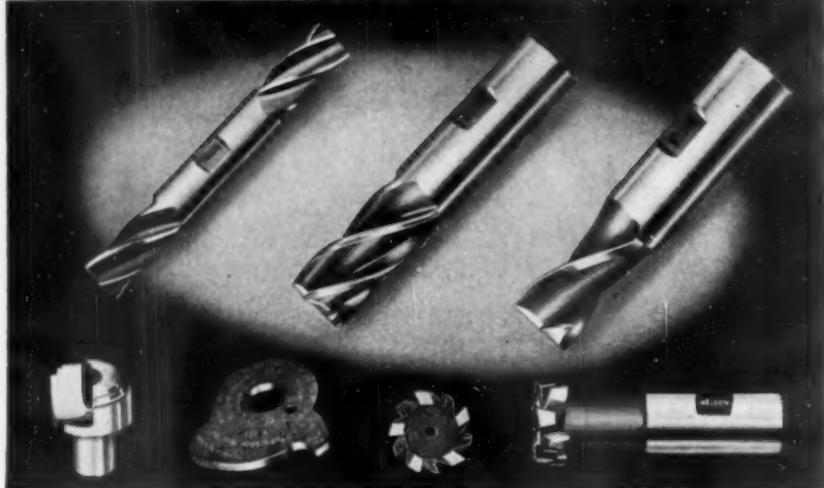
New England Carbide Tool Co. carries a large stock of loose diamonds for your own selection.



NEW ENGLAND CARBIDE TOOL CO., Inc.

60 BROOKLINE ST., CAMBRIDGE 39, MASSACHUSETTS

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON Tools for WELL DONE Jobs

Your cutting jobs can't be any better than your cutting tools. That's why in making WELDON Tools the emphasis is on *quality*, first, last and all the time.

No expense is spared on engineering, material and workmanship to insure the superior performance, strength and dependability of WELDON Tools. Their use is your first step in seeing that your cutting jobs are "well done".



Write for
Catalog 8-B



THE WELDON TOOL CO. *Cleveland 4,
Ohio*
3000 WOODHILL ROAD

PASSING PARADE

Professional Honor—Edward E. McConnell, Norton Company Controller, was elected a vice president of the Controllers Institute of America at the 13th annual session of that organization, devoted to improvement of controllership procedure.



Fred Grotts



W. W. Greenway

Production Engineer—William W. Greenway is now Production Engineer for Mt. Vernon Car Manufacturing Company and J. P. Devine Manufacturing Company, divisions of H. K. Porter Company, Inc., of Pittsburgh. He was formerly Production Specialist for Austin Western Company. Fred Grotts, President of Fort Pitt Steel Casting Company, Porter subsidiary, has taken over the post as Director of Research and Metallurgy for all Porter plants. This appointment is in addition to his present assignment. Grotts is widely known as an authority on heat treatment of cast steel and cast iron.

Changes Manager—Allegheny Ludlum Steel Corporation reports promotion of A. W. Nelson as District Sales Manager of their Indianapolis office. R. C. Presley will transfer from the Chicago district to become District Representative in Minneapolis.

Pioneer Retires—Christian Steenstrup, engineer in charge of General Electric's Refrigeration Engineering Division, has retired, according to announcement of J. M. Howell, Schenectady Works Manager. Steenstrup will be succeeded by D. F. Newman, Engineer, and L. W. Atchison, Assistant Engineer. Steenstrup holds 113 patents in refrigerator manufacture and engineering, and has been called the "father" of the company's suggestion system.

Assistant Engineer—Mack Trucks, Inc., announces appointment of William M. Kauffmann as Assistant to the Chief Engineer, in charge of Diesel engine development. Announcement was by L. C. Josephs, Vice President and Chief Engineer. Kauffmann is a graduate of Illinois Institute of Technology.

Manager Promoted—James L. Dunn, Assistant Plant Manager of Jenkins Bros. Bridgeport Plant, has been elected to Vice President in Charge of Industrial Relations. He has served his company as Production Manager and Business Manager.

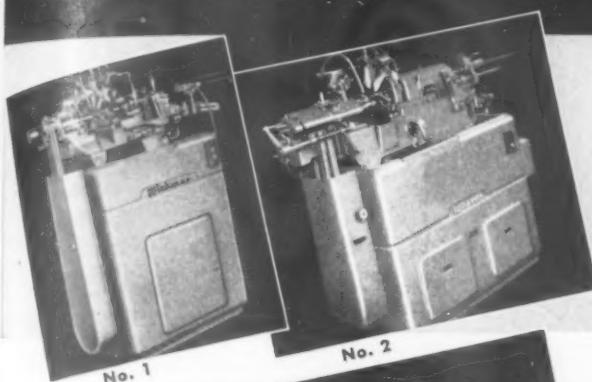
Field Distributor—Joel Whitney, formerly with Rotor Tool Company, has joined Master Tool Company, Inc., as distributor in the New England states.

(Continued on page 222)

THE TOOL ENGINEER

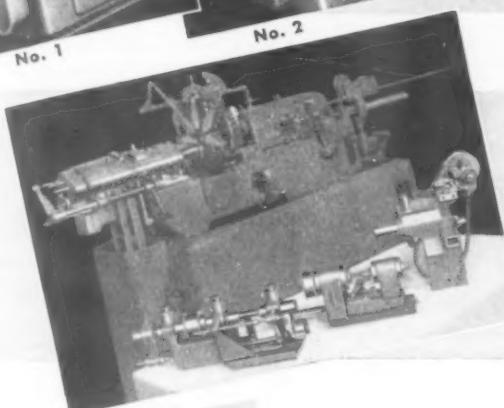
FOR PRODUCING SMALL
PRECISION PARTS FROM BAR
STOCK ON A HIGH PRODUCTION
BASIS

Wickman MEETS *Every* NEED



No. 1

No. 2



TWO SWISS TYPE HIGH PRECISION AUTOMATICS

Wickman Swiss Type High Precision Automatics are unequalled in the rapid, accurate production of small slender parts such as those for instruments, watches, and other precision mechanisms. They employ the Swiss principle of cam controlled coordinated tool and headstock movements to generate even the most intricate forms with single point tools. The No. 1 machine, accurate to $\pm .0002"$, will handle $5/32"$ and smaller bar stock for parts up to $1 \frac{9}{16}"$ long. The capacity of the No. 2 machine, accurate to $\pm .0005"$, is $1/2"$ diameter by $4"$ long.

A FULL COMPLEMENT OF ATTACHMENTS

The complete set of attachments for performing secondary operations on both Wickman Automatics includes a three spindle attachment for drilling, reaming, threading, tapping and similar operations; a high speed drilling attachment; a threading and tapping attachment; a screw slotting attachment; a side milling attachment; and a taper turning attachment for extreme accuracy in long taper turning.

COMPLETE TOOLING SERVICE

We can promptly furnish you with complete tooling including tools, cams, collets and tungsten carbide guide bushings made and tried out under production conditions in our Detroit plant. Thus perfect performance on the job is assured. If you prefer to finish your own tooling, complete stocks of blanks are maintained ready for immediate shipment.

A COMPETENT ENGINEERING STAFF

A capable staff of engineers with wide experience in Swiss Type Automatic work is always at your service. They will process the part, as well as design and make the tools.

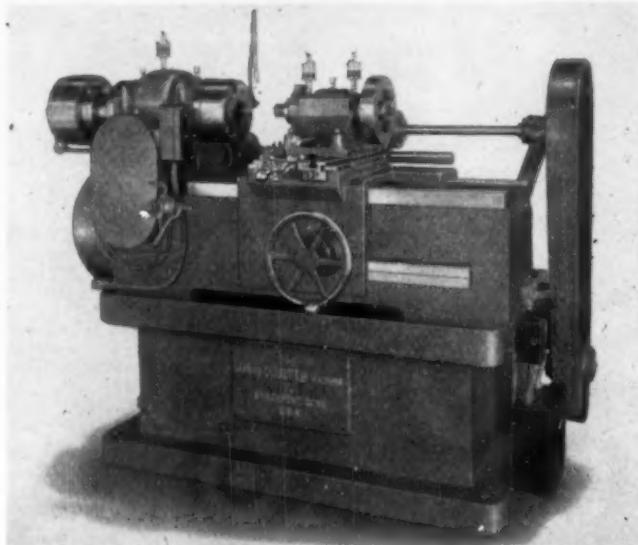
If you are producing small precision turned parts, call in a Wickman engineer. Without obligation he will gladly show you where Wickman Swiss Type High Precision Automatics can help in your production.

THE
Wickman
CORPORATION

15535 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

PRECISION THREAD MILLER

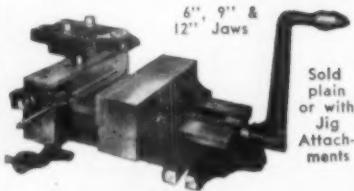
FULL AUTOMATIC CONTROL



INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U.S.A.

FOR POSITIONING PLAIN AND IRREGULAR SHAPES



GRAHAM
MULTI-PURPOSE VISE

With insertable special jaws, and numerous stops, guides and attachments, this vise is a ready-made jig for hundreds of uses. Sizes from 124 lbs. for planer, shaper, drill press, radial, miller, grinder, etc.

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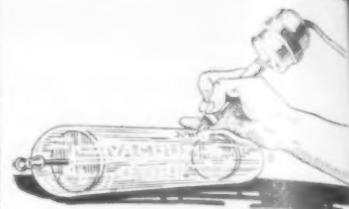
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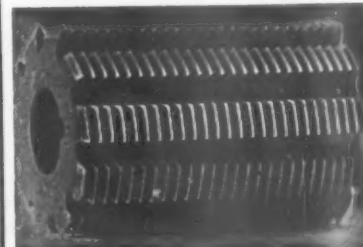
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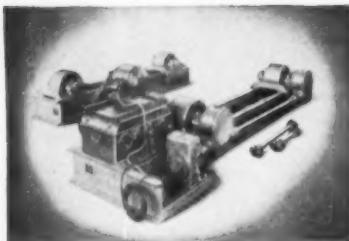
For Tool Engineers, Manufacturers and Production Men studying new techniques and methods of manufacture, a new 32-page catalog on reaming operations and their effect on final cost has just been published by The Madison Mfg. Company of Muskegon, Michigan.

Keynoting the entire publication is the simplicity of design and operation of Madison Adjustable Reaming Tools. A one-screw adjusting feature allows a precision adjustment of the Madison cutter with an ordinary screw driver. The Madison bar permits the cutter to be floated directly at the point of its insertion in the bar, eliminating the cost of high-priced floating tool holders and chucks. Interchangeability of cutters in the bar through presizing, gives the operator a more versatile tool, allowing many different diameters to be reamed with one bar and a number of cutters. This feature also omits disturbance of the original set-up when cutters need resharpening.

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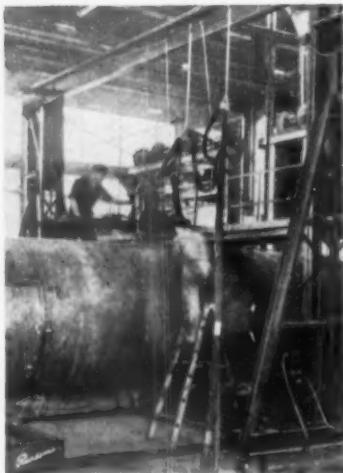
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PASSING PARADE

Chief Inspector—Succeeding M. K. Hovey, recently appointed General Plant Manager of Chevrolet plants in Flint, Mich., Leo E. Taylor has been named Chief Inspector of Chevrolet's Pratt & Whitney aviation engine project headquartered in Buffalo. Announcement was made by C. E. Wetherald, General Manufacturing Manager. Taylor has been employed by Chevrolet since 1918 in various capacities.



A. J. Allen



A. H. Godfrey

Postwar Progress—Aiming at minimum time lag in reconversion, Firth-Sterling Steel Company is perfecting its organization to handle service requirements of its clients, according to L. Gerald Firth, President. Key men named include: J. P. Larkin, Chief Metallurgical and Sales Engineer; Andrew H. Godfrey, Assistant Manager, Firthite Division; Anthony J. Allen, Assistant Manager, Firthaloy Division; Thomas W. Gabriel, Ohio District Sales Manager; and Lloyd W. Clowes, Pittsburgh District Sales Manager.

Aircraft Officials—William A. Mara has joined the executive staff of Bendix Aviation Corporation as supervisor and coordinator of product development. He was recently named sales and service director for Consolidated Vultee. A. A. Kucher, Director of Research and Chairman of the Long-Range Planning Committee, has been elected a vice president of Bendix. Both appointments were announced by Ernest R. Breech, President.

Two Promoted—Aero Equipment Corporation's Board of Directors has elected J. P. Johnson Executive Vice President. He was formerly Vice President. J. E. Allen, Assistant to the President, was elevated to Vice President. Both advancements were announced by J. C. Markey, President.

Project Engineer—Promotion of Orest A. Meykar to Project Engineer is announced by Machine and Tool Designing Company. Meykar will supervise several customer accounts, according to Joseph S. Pecker, who has been expanding activities of the firm to include postwar machine design and product development.

Master Mechanic—Forest W. King, formerly Master Mechanic at Willys-Overland, has become Master Mechanic at Warren City Manufacturing Company, Graham-Paige Motors Corporation subsidiary. He attended Toledo University. Chester L. Shaw has been named Personnel Director.
(Concluded on page 224)

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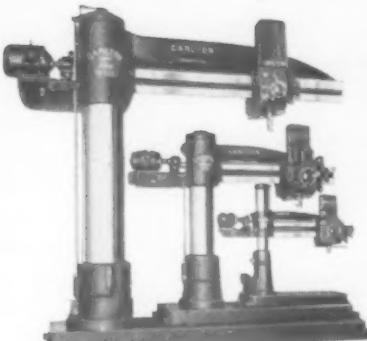
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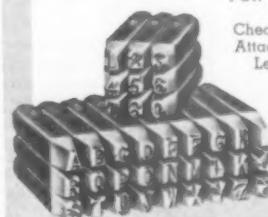
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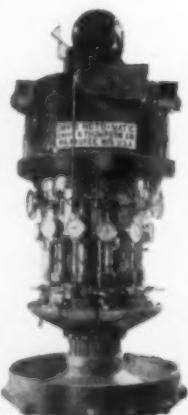
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Deaths

Elmer W. Davis, 83, retired Superintendent of the William Cramp and Sons Ship and Engine company died in September following a brief illness.

Earl L. Myers, 52, General Superintendent, Gisholt Machine Company, died at Madison following a lengthy illness. He had been associated with Gisholt since 1928.

Peter E. Martin, 62, former Vice President, Ford Motor Company, died during October in Detroit. He had been on leave of absence since 1941 because of ill health.

William A. Grey, 58, for more than 20 years an officer of Crescent Brass & Tin Company, died on Harsen Island during September.

Philip L. Bannan, Sr., pioneer West Coast gear builder, died at his San Francisco home in October. He organized the Pacific Gear & Tool Works early in the century.

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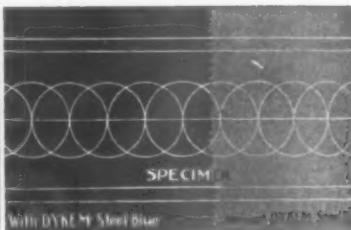
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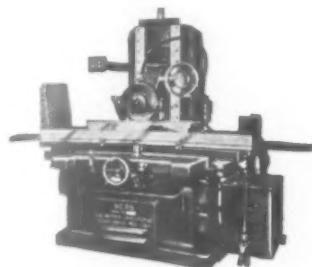
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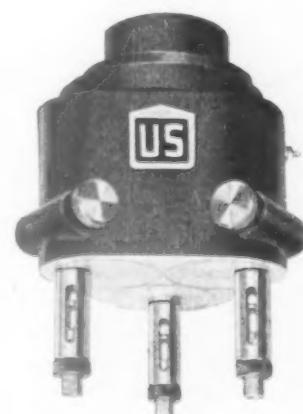
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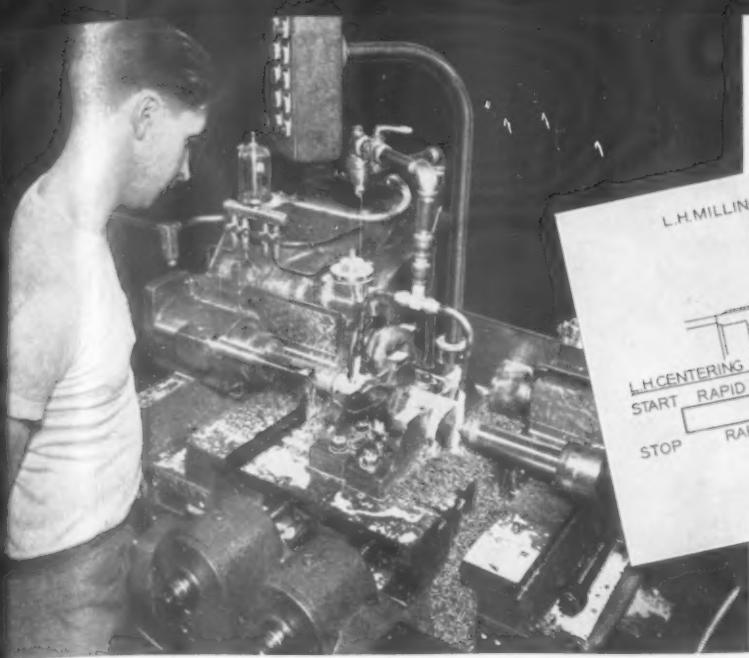
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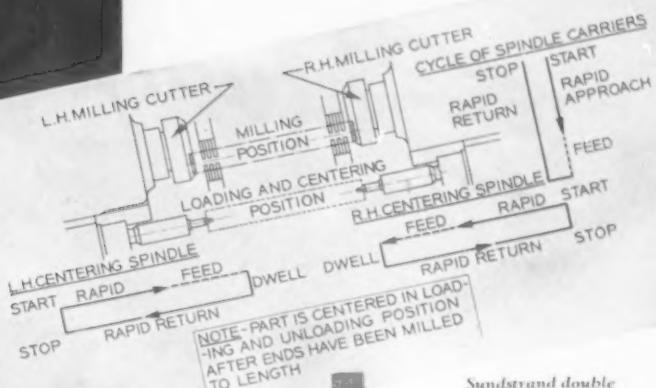
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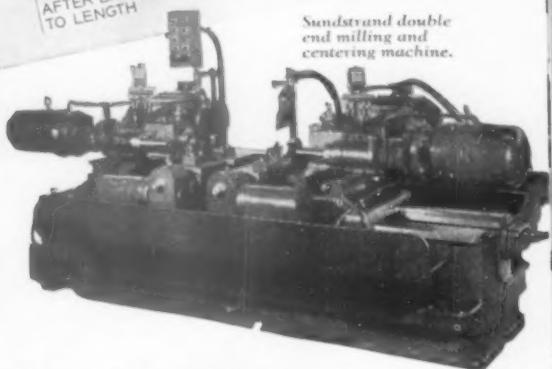
Acme Industrial Co.	182	Lincoln Park Industries, Inc.	228
Acme Machine Tool Co., The	154	Lodge & Shipley Machine Tool Co., The	112
Allen Gauge & Tool Co.	211	Logansport Machine Co., Inc.	14
Allen Mfg. Co., The	112	Lombard Governor Corp.	183
Am. Broach & Machine Co.	201	Lovejoy Tool Co., Inc.	204
Am. Cutter & Engineering Corp.	184	Lufkin Rule Co., The	33
Am. Swiss File & Tool Co.	122	McCrossy Tool Corp.	228
Ames Co., B. C.	190	Machinery Mfg. Co.	196
Amico Metal, Inc.	192	Macklin Co.	174
Anderson Bros. Mfg. Co.	191	Madison Mfg. Co.	60
Anker-Holt Mfg. Co.	140	Master Chrome Service, Inc.	130, 221
Apex Machine & Tool Co., The	173	Matthews & Co., Inc., Jas. H.	197
Armstrong-Blum Mfg. Co.	175	Mattison Machine Works	223
Armstrong Bros. Tool Co.	132	Mead Specialties Co.	56
Baker Bros., Inc.	135	Merz Engineering Co.	148
Baldor Electric Co.	220	Michigan Tool Co.	170
Barber-Colman Co.	16	Micromatic Hone Corp.	121
Barnes Drill Co.	41	Midwest Tool & Mfg. Co.	197
Barnes Co., W. F. & John	108	Monarch Machine Tool Co., The	187
Bay State Abrasives Products Co.	36	Monarch Steel Co.	15
Belows Co., The	25	Morse Twist Drill & Machine Co.	32
Blake Co., Edward	194	Motor Products Corp., Deepfreeze Div.	54
Bokum Tool Co.	208	Murchey Machine & Tool Co.	141
Bowser, Inc.	188	Nash Co., J. M.	192
Boyar-Schultz Corp.	210	National Acme Co., The	44
Bradford Machine Tool Co., The	180	National Automatic Tool Co.	129
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Brown & Sharpe Mfg. Co.	29	National Tool Salvage Co.	225
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Bullard Co., The	96	Nielsen, Inc.	211
Campbell Div., Andrew C., Am. Chain & Cable Co., Inc.	177	Norton Co.	110
Carbooy Co., Inc.	103	Oilgear Co., The	37
Carborundum Co., The	8, 9	O'Neil-Irwin Mfg. Co.	202
Cartier Machine Tool Co., The	223	Onsrud Machine Wks., Inc.	189
Carpenter Steel Co., The	21	Oster Mfg. Co., The	51
Carro de Pasco Copper Corp.	184	Ott Machinery Sales, Inc.	225
Chamberlain Engineering Co.	10	Ozalid Products Div.	45
Chicago Pneumatic Tool Co.	48	Parker-Kalon Corp.	40
Chicago Rawhide Mfg. Co.	16	Physicists Research Co.	216
Chicago Riveted Machine Co.	193	Pioneer Engineering & Mfg. Co.	179
Chicago Wheel & Mfg. Co.	39	Pipe Machinery Co., The	137
Cincinnati Milling Machine Co., The	114	Pope Machinery Corp.	42
Cincinnati Shaper Co., The	119	Pratt & Whitney Division	47
Circular Tool Co., Inc.	144	Product Machine Co., The	146
Cleerman Machine Tool Co.	34	Putnam Tool Co.	186
Cleveland Automatic Machine Co., The	16	Quality Tool & Die Co.	153
Cleveland Tapping Machine Co.	192	Racine Tool & Machine Co.	39
Cleveland Twist Drill Co., The	4	Ransome Machinery Co.	222
Cogdill Twist Drill Co.	158	Ready Tool Co., The	180
Columbia Tool Steel Co.	183	Rehnberg-Jacobson Mfg. Co.	124
Comtor Co., The	208	Reliance Electric & Engineering Co.	188
Cone Automatic Machine Co., Inc.	53	Republic Gage Co.	144
Continental Machines, Inc.	118	Richmont, Inc.	120
Cooper-Bessmer Corp., The	62	Roberts Rubber Co., Weldon	198
Coulter Machine Co., The James	220	Hobbing Engineering Co.	209
Covell Mfg. Co.	165	Hockford Magnetic Products Co.	146
Crucible Steel Co. of America	55	Ruthman Machinery Co., The	223
Cullen-Friedstedt Co.	199	Scherr Co., Inc., Geo.	198
Cushman Chuck Co., The	139	Scully-Jones & Co.	4th Cover
Dandy Machine Specialties, Inc.	155	Seneca Falls Machine Co.	127
Darwin & Milner, Inc.	210	Severance Tool Industries, Inc.	50
Davis & Thompson Co.	224	Sheffield Corp., The	113
Davis Boring Tool Co.	149	Sheldon Machine Co., Inc.	207
Dayton Rogers Mfg. Co.	158	Sidney Machine Tool Co., The	145
Desmond-Stephan Mfg. Co., The	224	Siewek Tool Div. of Domestic Ind., Inc.	6
Detroit Broach Co.	30	Simonds Saw & Steel Co.	156
Detroit Power Screwdriver Co.	212	Smit & Sons, J. K.	148
Detroit Stamping Co.	210	Sosner Company	156
Detterbeck Co., George L.	184	South Bend Lathe Works	38
DeWalt Products Corp.	132	Standard Gage Co., Inc.	1
Dixon Crucible Co., Jas.	199	Standard Oil Co., (Indiana)	211
Dyken Co., The	224	Staples Tool & Engineering Co.	121
Eastern Cutter Corp.	197	Starrett Co., The L. S.	100
Etco Tool Co.	209	Stokerunit Corp.	171
Ex-Cell-O Corp.	133	Strong, Carlisle & Hammond Co.	172
Fairmount Tool & Forging Co.	160	Stuart Oil Co., Ltd., D. A.	206
Federal Products Corp.	105	Sturdimate Tool Co.	193
Federal Tool Corp.	150	Sturtivant Co., P. A.	154
Felker Mfg. Co.	Front Cover	Sundstrand Machine Tool Co.	227
Firth-Sterling Steel Co.	32	Sunnen Products Co.	28
Ford Motor Co., Johansen Gage Co.	180	Super Tool Co.	20
Gairing Tool Co., The	13	Eutton Tool Co.	181
Gallmeyer & Livingston Co.	225	Swartz Tool Co.	168
Gammons-Hoagland Co., The	211	Swedish Gage Co., of Am.	222
Garrison Machine Works, Inc.	207	Tanneuwitz Works, The	130
Giddings & Lewis Machine Tool Co.	11	Thompson & Son Co., The Henry G.	132
Gier & Anholt Tool Co.	225	Timken Roller Bearing Co., The	159
Gisholt Machine Co.	61	Tomkins-Johnson Co., The	58
Glenzer Co., The J. C.	169	Torit Mfg. Co.	183
Gorton Machine Co., George	5	Trico Products Corp.	191
Graham Mfg. Co.	220	Tungsten Alloy Mfg. Corp.	221
Grand Specialties Co.	223	Tungsten Carbide Tool Co.	26
Greenfield Tap & Die Corp.	66	Tungsten Electric Corp.	123
Greenlee Bros. & Co.	131	TungTip Tool Div. of Lowell & Grayson	151
Hanchett Mfg. Co.	49	Tuthill Pump Co.	182
Hanna Engineering Works	185	Union Carbide & Carbon Corp.	31
Hannifin Mfg. Co.	64	United Precision Prod. Co.	179
Hardinge Bros., Inc.	12	United States Drill Head Co.	225
Hartford Spec. Machinery Co., The	210	U. S. Machine Tool Mfg. Corp.	220
Haskins Co., R. G.	177	U. S. Tool Co., Inc.	203
Haynes Stellite Co.	31	Universal Engineering Co.	182
Heald Machine Co., The	27	Vascoley-Ramet Corp.	187
Hedstrom Corp., Oscar W.	152	Vickers, Inc.	157
Hilliard Corp., The	181	Vireo Corp.	35
Hobart Bros., Co.	191	Wales-Strippit Corp.	128
Hole Engineering Service	224	Walker & Turner Co., Inc.	208
Holo-Krome Screw Corp., The	2	Warner & Swasey Co.	95
Hunt & Son, C. B.	146	Webber Gage Co.	193
Hy-Pro Tool Co.	211	Welding Equipment & Supply Co.	178
Illinois Tool Wks.	18	Weldon Tool Co., The	218
Independent Pneumatic Tool Co.	46	Wendt-Sonis Co.	126
Ingersoll Milling Machine Co., The	215	Wesson Co.	189
Ingersoll-Rand Co.	23	Wetmore Reamer Co.	147
International Nickel Co., Inc., The	37	Wheel Trueing Tool Co.	17
Jansson Gage Company	198	Whistler & Sons, Inc., S. B.	24
Jarvis Co., The Chas. L.	43	Wickman Corp., The	219
Jones & Lamson Machine Co.	143	Willey's Carbide Tool Co.	182
Kearney & Trecker Prod. Corp.	7	Wilson Mechanical Instrument Co., Inc.	184
Kernamental, Inc.	136	Wood & Spencer Co., The	138
Leach Machinery Co., H.	193	Wrigley Jr., Co., Wm.	185
Lehmann Machine Company	63	Yoder Co., The	19
LeMaire Tool & Mfg. Co.	205	Zagar Tool Co.	207
Lewthwaite Machine Co., T. M.	225	Ziegler Tool Co., W. M.	198



Centering spindles automatically rapid traverse, feed to depth and rapid return after milling is completed.



Sundstrand double end milling and centering machine.



MILL TO LENGTH and CENTER IN ONE OPERATION . . .

CHECK YOUR WORK WITH THESE MACHINE SPECIFICATIONS

SPECIFICATIONS: MACHINE SIZE—WORK CAPACITY

No. 1-448	No. 1-484	No. 2-648	No. 2-672
Diameter Min. . . 1" min., 3½" max.	1" min., 3½" max.	1½" min., 6" max.	1½" min., 6" max.
Length Min. . . 8" min.; 48" max.	8" min.; 84" max.	14" min.; 48" max.	14" min.; 72" max.
Milling Head Speeds . . . 20 to 1200 r.p.m.	20 to 1200 r.p.m.	20 to 1200 r.p.m.	20 to 1200 r.p.m.
Feed Rate . . . Min. 1¼" per min. Max. 10' per min.	Min. 1¼" per min. Max. 10' per min.	Min. 0.72" per min. Max. 10' per min.	Min. 0.72" per min. Max. 10' per min.
Horsepower . . . 3 hp.	3 hp.	5 hp.	5 hp.
Center Drill—Speed . . . 600 r.p.m. (for ½" drill)	600 r.p.m. (for ½" drill)	600 r.p.m. (for ½" drill)	600 r.p.m. (for ½" drill)
Feed Stroke . . . ¾" feed; ½" rapid ¾" feed; ½" rapid ¾" feed; ½" rapid ¾" feed; ½" rapid			
Cutter Sizes— Center Drills . . . ¾" to ¾"	¾" to ¾"	¾" to ¾"	¾" to ¾"
Milling Cutters . . . 4" effective working diameter	4" effective working diameter	6½" effective working diameter	6½" effective working diameter
Notes . . . Screw operated standard. Power operated furnished as extra equipment.			

*Work shorter than 8" can be handled with single vise with special jaws. Speeds and feed strokes other than the standard shown above can be furnished on request.

Sundstrand Machine Maintains Definite Relation Between Ends and Centers . . .

Here is a modern method and machine for milling to length and centering on a production basis. It's accurate because the parts are milled and centered in the same set-up. It's economical, because the part is handled once instead of twice. It's profitable, because the operations are combined and the operator can run several machines. The head can be adjusted for different part lengths in approximately 20 minutes—making it profitable to include small as well as large lot sizes. Manufacturers of tractors, farm implements, aircraft parts, automobiles and Diesel engines are now using this machine to advantage. It will pay you to investigate the time saving and accuracy features of this machine.



**How to Get a Preliminary
Production and Machine Estimate**
Our engineers will be glad to assist in determining the proper machines required for your milling and centering operations. Merely send us your part prints giving production and operations required. There is no obligation.

SUNDSTRAND MACHINE TOOL CO.

Rigidmills • Fluid-Screw Rigidmills • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2532 ELEVENTH ST., ROCKFORD, ILLINOIS, U.S.A.

Salvaging OF STEEL GAGES By Hard Chrome Plating



★ MULTIPLIES THE
ORIGINAL LIFE OF
THE GAGE AT LEAST
FIVE TIMES

★ PRODUCTION
DEPARTMENTS GET
THE BENEFIT OF
GREATER
MANUFACTURING
TOLERANCES

A wide variety of gages—including thread plug gages—are salvaged by Lincoln Park. In addition, many types of non-cutting precision tools are adaptable to Lincoln Park's chrome plate salvaging operations.

Chrome plate salvaging is—and has been for several years past—an important and highly specialized part of Lincoln Park's operations. This service offers two important advantages to any customer.

First, the average wear-resistance of a Lincoln Park chrome plated gage is approximately five times that of a similar steel gage. Second, with any gages, wear allowance must always be taken into consideration. When wear-resistant gages are used, it is obvious that allowance for wear can be reduced considerably . . . automatically increasing the manufacturing tolerance. This slight extra percentage of tolerance becomes highly important when the dimensions of parts being inspected are very close to required limits.

Today, Lincoln Park has a new, modern chrome plating department housed in a separate building adjoining the main plant. In this department are all the facilities to put new life and greater usefulness into all of your gages and non-cutting precision tools which can be salvaged by chrome plating.

NOW . . . YOU CAN EXPECT PROMPT DELIVERY OF SALVAGED GAGES

Deliveries on salvaging work are considerably improved. Our weekly "Current Delivery Schedule" provides exact information. If you are not receiving this schedule regularly we will be glad to add your name to our mailing list.



LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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THE TOOL ENGINEER

VISES—*for Varied Uses*



STRONG—ACCURATE—DURABLE

Brown & Sharpe Vises are made as low as possible to hold work close to the machine table.

A bearing the full width of the vise jaws gives solid support to withstand pressure of the cut . . . even at the extreme ends of the jaws.

The heavy screws are of a form and lead chosen particularly for the requirements of each type of vise.

The complete line of Brown & Sharpe Vises includes styles for practically every machine shop requirement. Circular showing complete listing sent upon request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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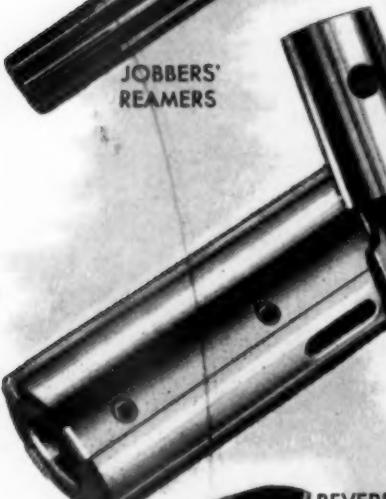
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FOR HIGHER SPEEDS

Where cutting speeds must be increased to keep pace with modern methods, Scully-Jones and Company standard tungsten carbide and Haynes Stellite tipped tools effect substantial savings by increasing production, giving better finish, longer tool life with less regrinding, and lower cost per unit produced.

Years of experience and engineering knowledge assure correct grades of alloys for your particular job. Our facilities provide prompt and dependable service.

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